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1961

VOLUME 65 NUMBER 4

ANNUAL MEETING, OCTOBER 8-13, 1961, CHICAGO

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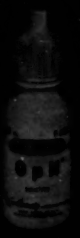

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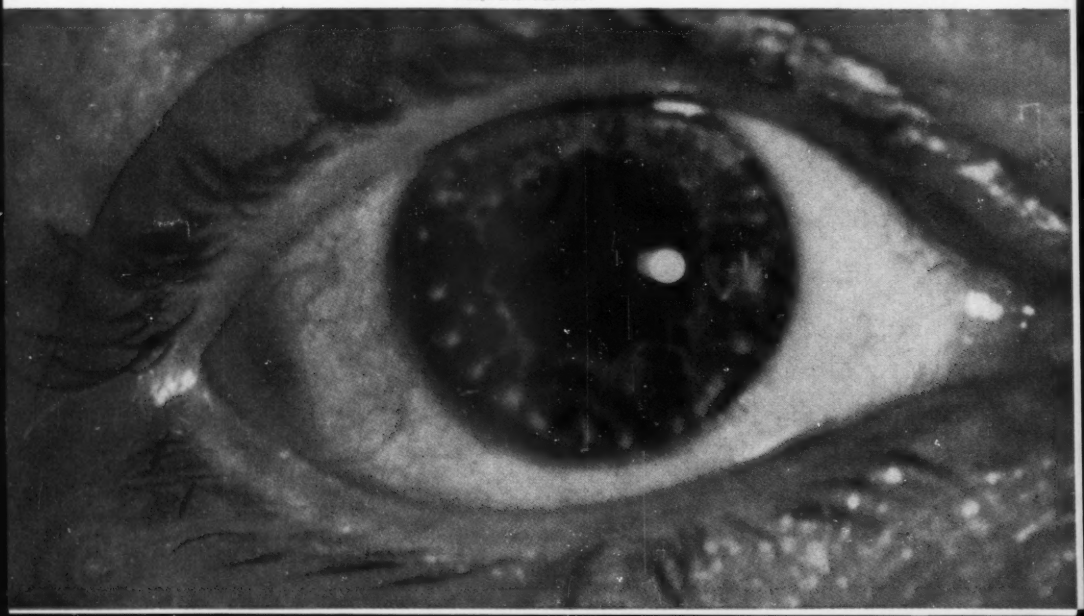

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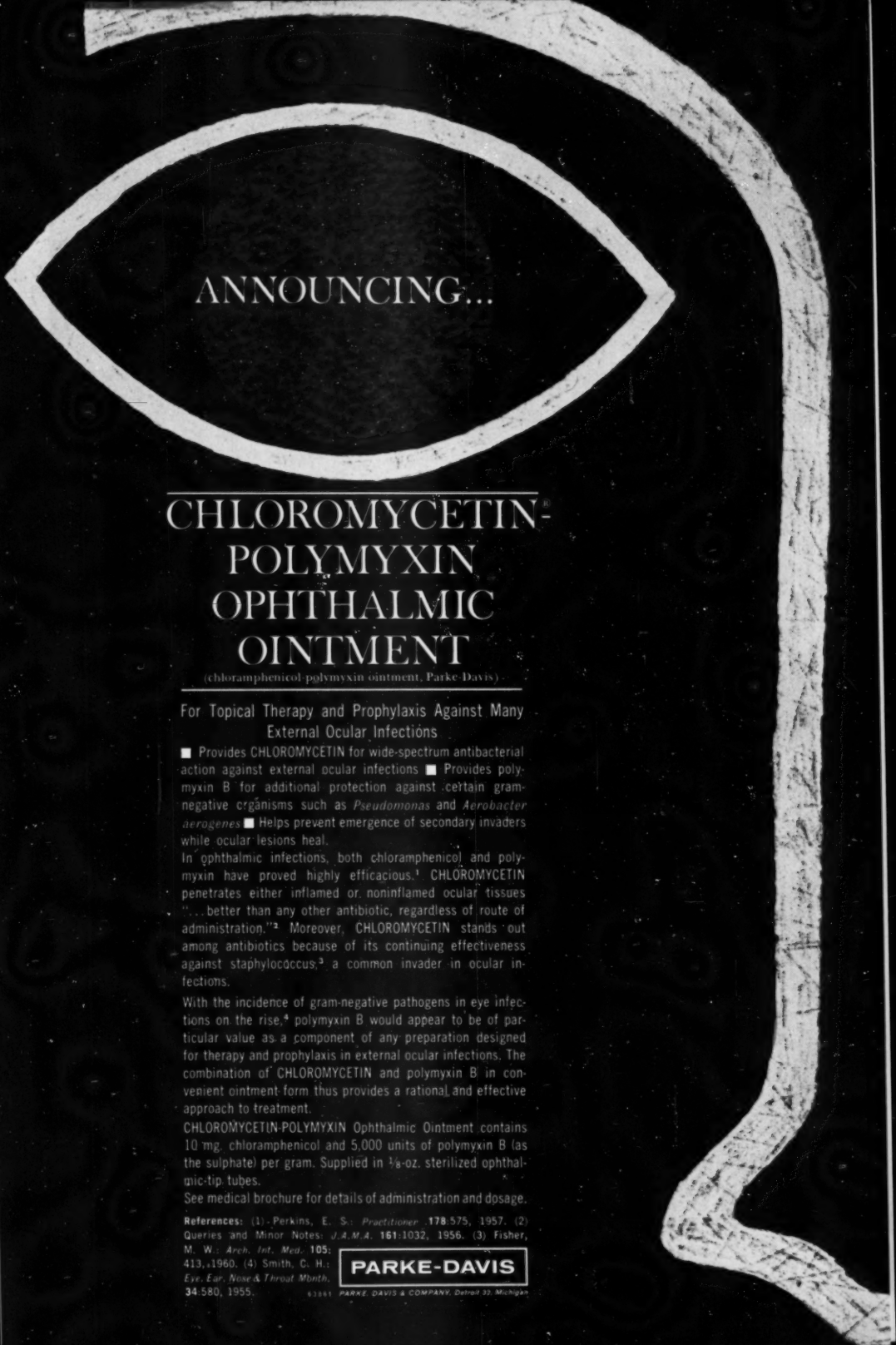

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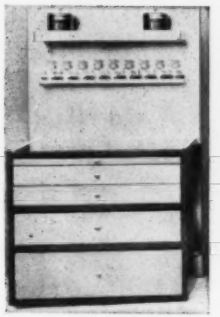

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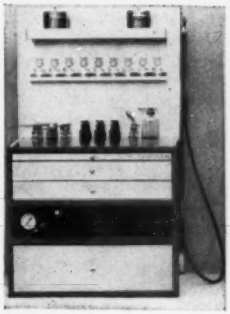

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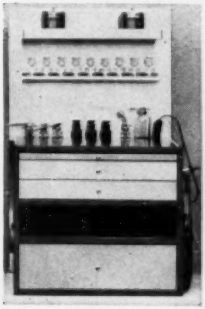

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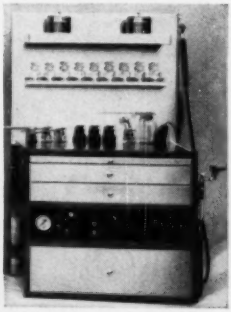

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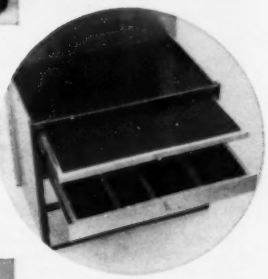

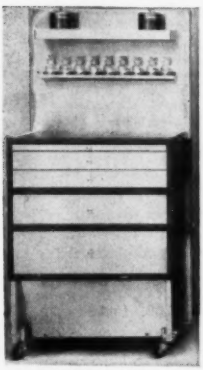

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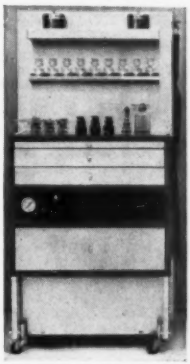

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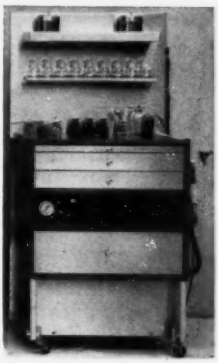

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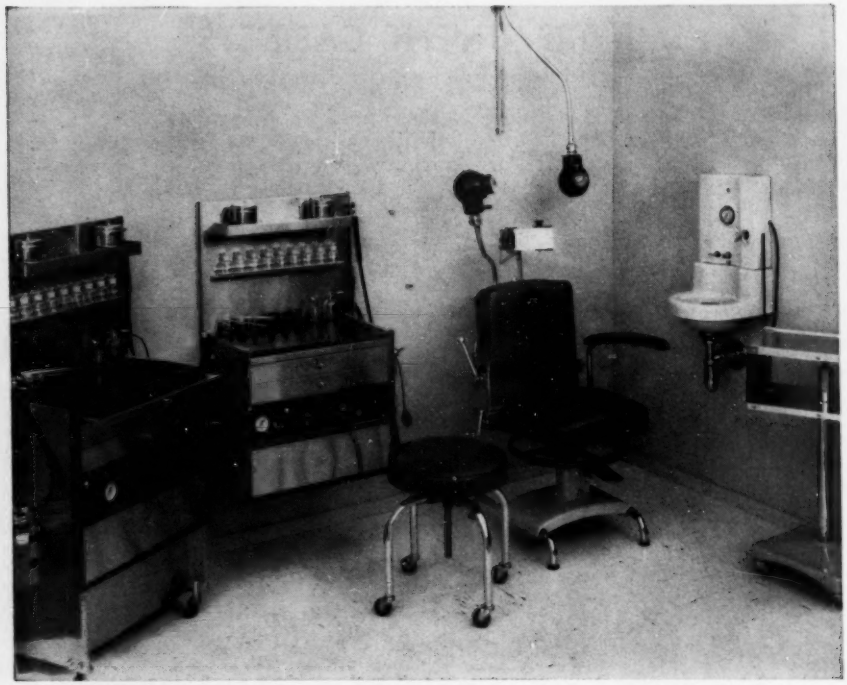

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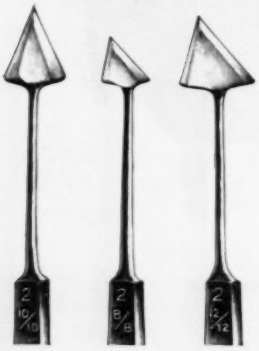

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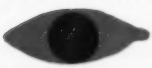

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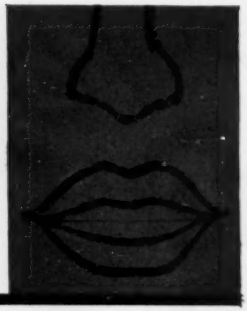

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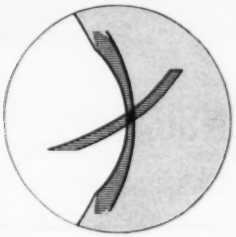
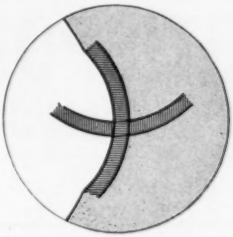


Lacrimal distribution with spherical base curve



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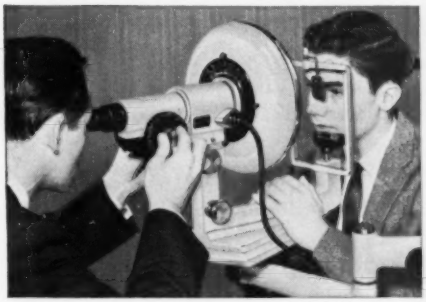

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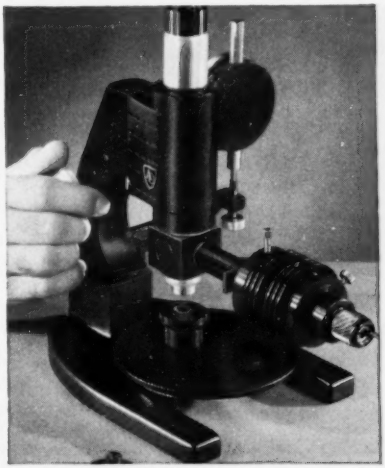

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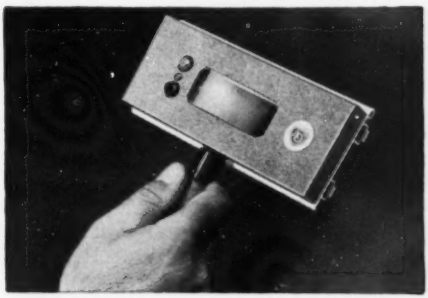

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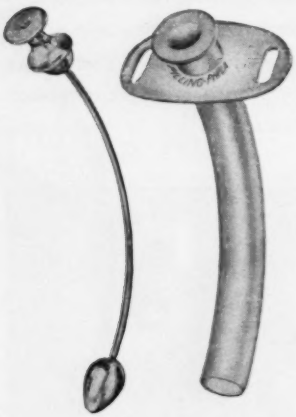

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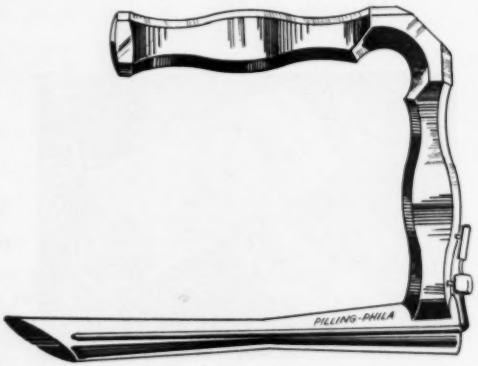

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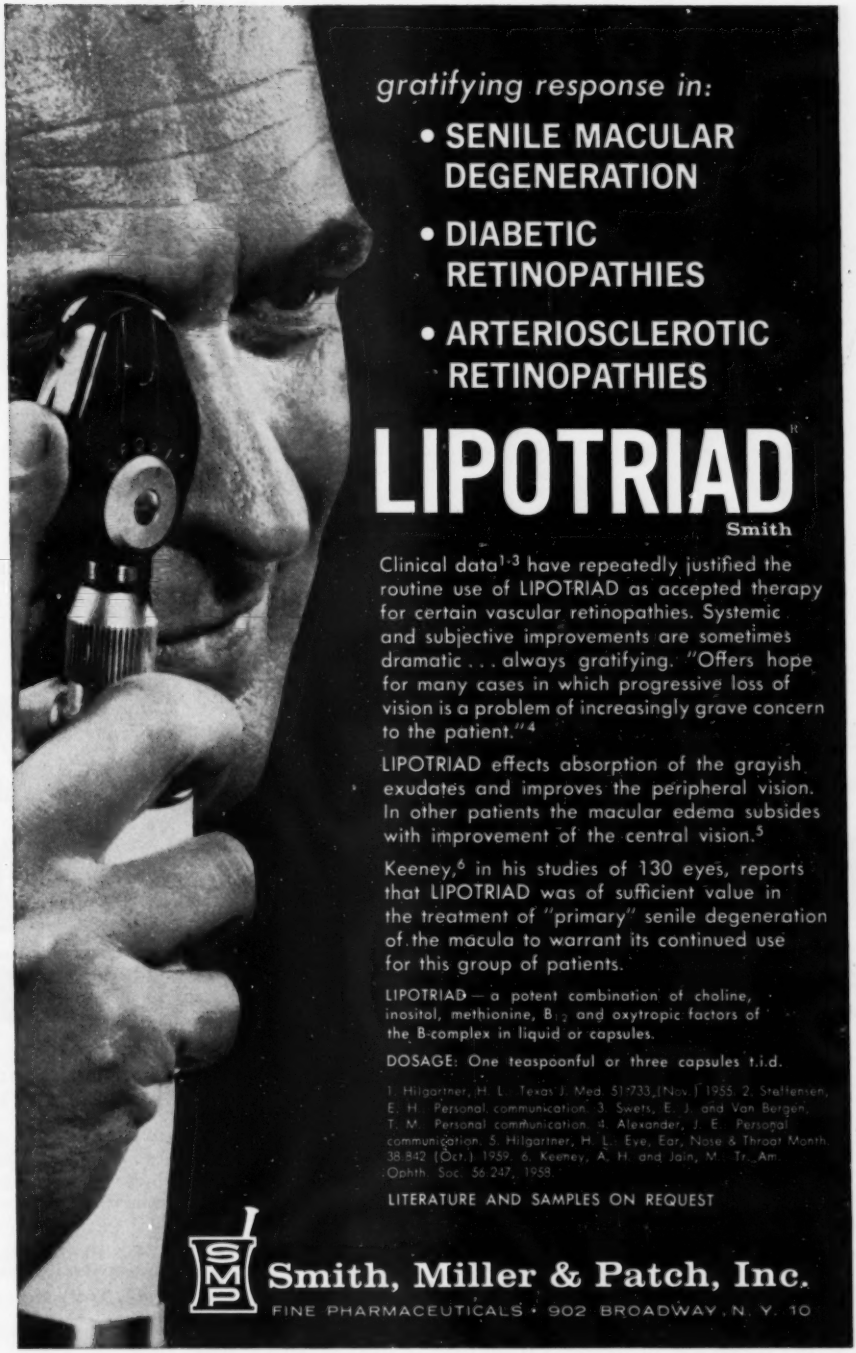

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1. Hilgartner, H. L.: Texas J. Med. 51:733, (Nov.) 1955. 2. Stattensen, E. H.: Personal communication. 3. Swets, E. J. and Van Bergen, T. M.: Personal communication. 4. Alexander, J. E.: Personal communication. 5. Hilgartner, H. L.: Eye, Ear, Nose & Throat Month. 38:842 (Oct.) 1959. 6. Keeney, A. H. and Jain, M.: Tr. Am. Ophth. Soc. 56:247, 1958.

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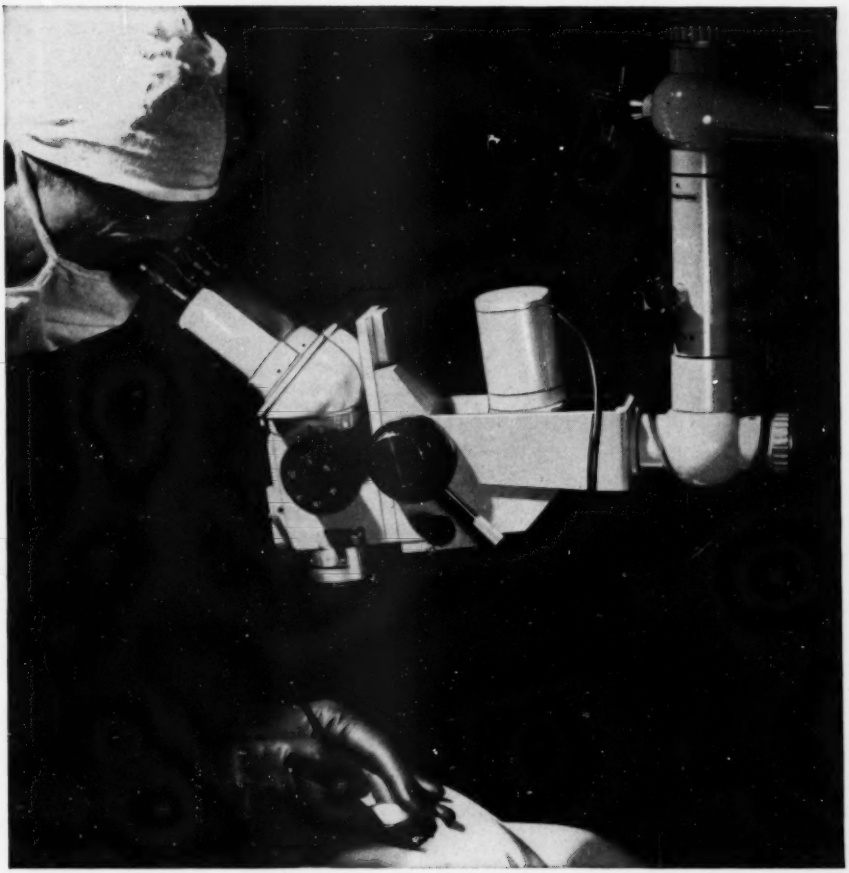

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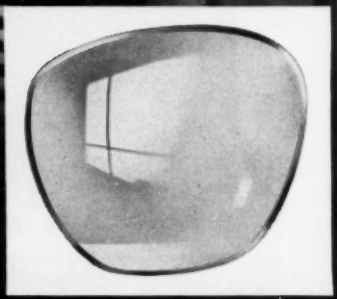

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1. *Am. J. Digest. Dis.* 22:5, 1955.
2. *M. Times* 84:741, 1956.
3. *Am. J. Ophth.* 42:771, 1956.
4. *Southwestern Med.* 40:120, 1959.

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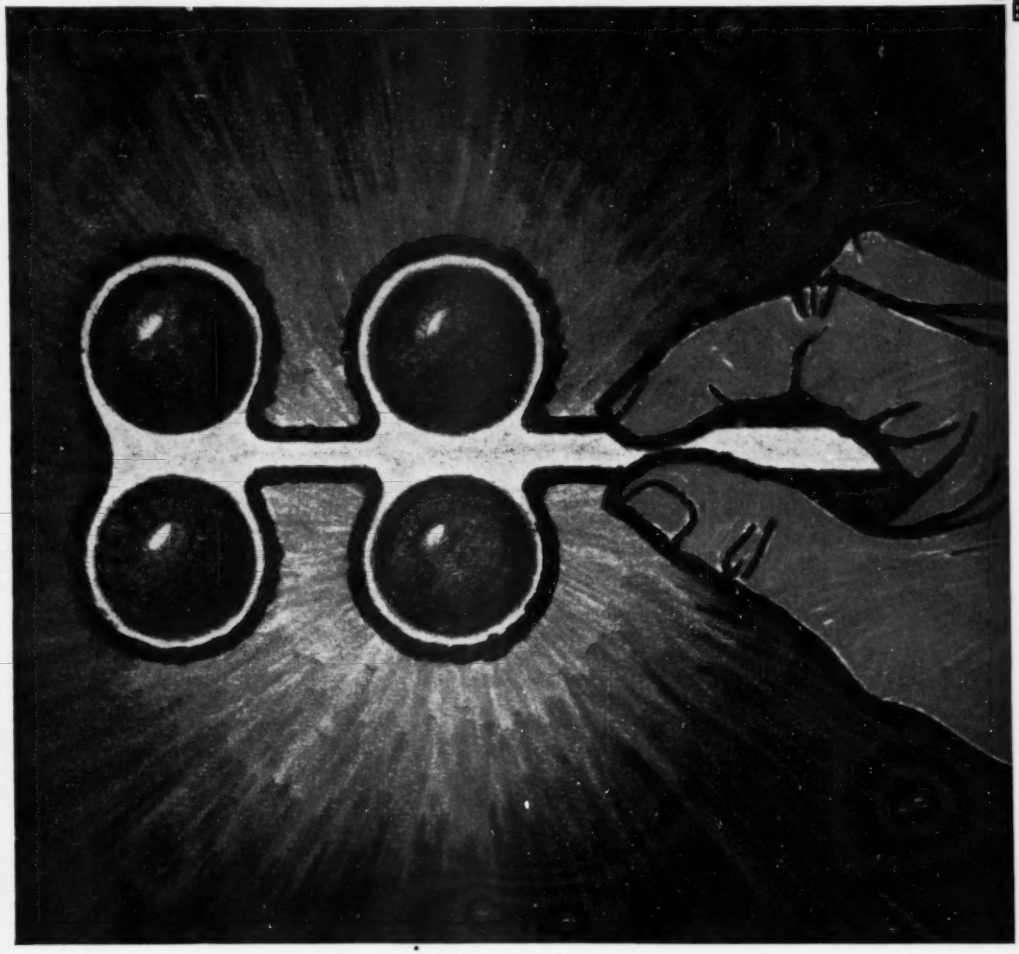

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References: (1) Morrison, W. H.: *Nebraska M. J.* 45:106, 1960. (2) Perkins, E. S.: *Practitioner* 178:575, 1957. (3) Tassman, W. S.: *U. S. Armed Forces M. J.* 10:161, 1959. (4) Kamiya, S.: *Am. J. Ophth.* 42:269, 1956. (5) Holland, R. W. B.: *Arch. Ophth.* 57:214, 1957. (6) Benton, C. D., Jr.: *South M. J.* 51:1562, 1958. (7) Blakiston's New Gould Medical Dictionary, ed. 2, New York, McGraw-Hill Book Company, Inc., 1956, p. 945. (8) Ostler, H. B., & Braley, A. E.: *J. Iowa M. Soc.* 44:427, 1954.

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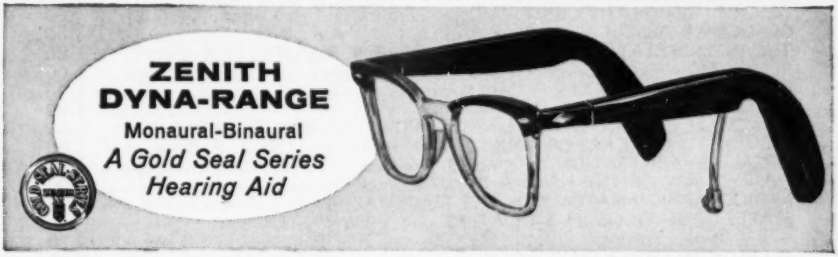

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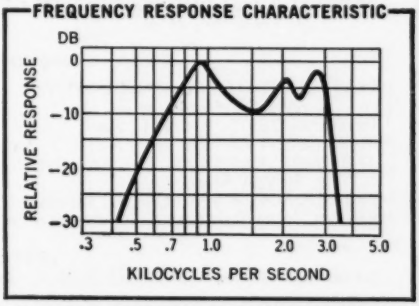

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EXPERIMENTAL STUDIES ON SOME LITTLE UNDERSTOOD ASPECTS OF THE PHYSIOLOGY OF THE RESPIRATORY TRACT AND THEIR CLINICAL IMPORTANCE

A. C. HILDING, M.D., PH.D.
DULUTH, MINNESOTA

I AM deeply conscious of the great honor of being invited to present the Wherry Memorial Lecture. Other Wherry Lectures have memorialized Dr. Wherry, so I shall content myself simply with saying that I recall him as a very kindly and jovial friend, as well as an effective leader in our specialty and in the Academy.

The increased incidence of malignancy in the respiratory tract in recent years has stimulated renewed interest in the physiology of ciliary streaming,* which is of paramount importance in the physiology of the respiratory tract. This is especially true in the lower tract, where it might be said to be vital. A few workers have been interested in this aspect of physiology for a great many years, and, during the past thirty years, considerable information has been added.† However, the mechanism behind ciliary streaming is not completely understood and many unsolved problems remain.

Among these unsolved problems are questions regarding the velocity of ciliary streaming, including the existence of a speed gradient; the normal mucous volume of the respiratory tract, and where mucus is normally produced; the comparative depth of the mucous blanket in various parts of the tract; how drainage distal to the respiratory bronchioles is effected; the vulnerability of the ciliary mechanism to manipulation, and the cause of squamous cell metaplasia in healthy people.

REVIEW OF THE PHYSIOLOGY OF CILIARY DRAINAGE

A thumbnail sketch of the physiology of ciliary drainage might not be amiss. The cilia in the human respiratory tract are from 5 to 7 microns in length, number about 100 per square micron, and beat 700 to 1000 times a minute. They have two phases, an active phase and a phase of recovery. The stimulant that triggers the beat is unknown, as is the control of their remarkable coordination.[20,25,76,86] They are powerful and can move huge loads relative to their own length. In the nose, the direction of ciliary streaming is down and back; in the

From the Research Laboratory, St. Luke's Hospital, Duluth 11, Minnesota. Work supported by grants from the Louis W. and Maud Hill Family Foundation of St. Paul, the Edward C. Congdon Memorial Trust, Miss Elisabeth Congdon, and the Women's Service Guild of St. Luke's Hospital.

Prepared for presentation at the Sixty-Fifth Annual Session of the American Academy of Ophthalmology and Otolaryngology, Oct. 9-14, 1960, Chicago. (Not presented at the meeting because of illness.)

*References 1-3, 5, 20-22, 28, 48-51, 52-57, 60-65, 69, 72, 73, 77, 80, 81, 83, 87, 88, 90, 91.
†References 4, 8, 15, 16, 19, 23-27, 29, 32, 34-39, 41, 42, 44, 45, 47, 58, 66-68, 71, 74-76, 84-86, 89, 91-93.

lower respiratory tract, it is vertically upward, directed against gravity.

The secretion in which and upon which the cilia work is divided into at least two layers[68]: a viscid mucous blanket layer, overlying the tips of the cilia, and a watery layer, in which the cilia move, extending from the cell membrane to the ciliary tips (fig. 1). The blanket is slippery, viscid, and will sustain a certain amount of traction. The velocity of flow is from 10 to 15 millimeters per minute.[38]

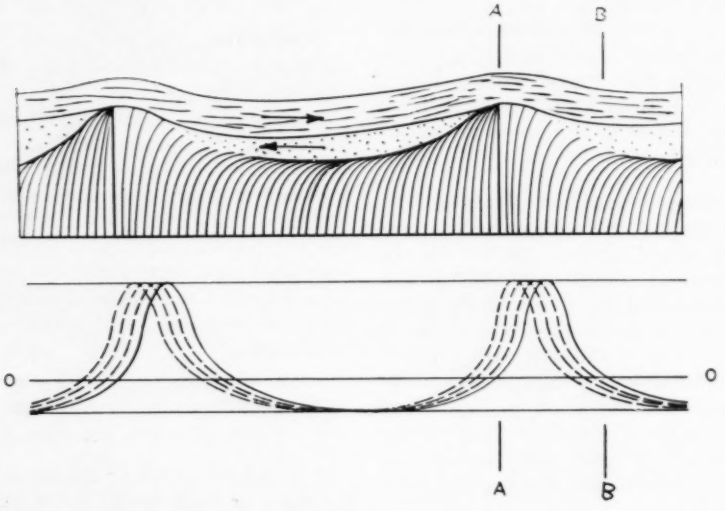

FIG. 1—Ciliary movement. In the upper figure, A to B represents the active phase, which occupies about one fourth of the cycle. The two layers of secretion, as described by Lucas, are indicated, the mucous blanket lying upon the crest of the waves and the watery layer beneath. The progress of the mucous blanket is toward the right and the progress of the waves toward the left. The lower figure illustrates the velocity of the tips of the cilia during the active phase. These illustrations do not represent measurements and are almost certainly not correct in detail. The point is that it is possible for the blanket to move continuously at or near the peak velocity of the tips of the cilia.

Velocity of Flow of Mucus

For a long time I have puzzled over the question of how a velocity of 15 millimeters per minute could be attained. The cilium begins its beat in the vertical position, and even if it were effective for its full length and beat 1000 times a minute, this would seem to account for a velocity of only 5 millimeters per minute. But it is not effective for its own length, nor anywhere near it; the tip moves in an arc of probably about 30 to 40 degrees, or roughly 2.5 to 3.0 microns at each stroke. This would seem to reduce the velocity to 2 to 3 millimeters per minute. This is, of course, only a superficial analysis of the matter. The blanket does not start and stop with each ciliary beat like the film in a cinema camera. It presumably moves continuously and smoothly, propelled by the effective stroke only. Dalhamn[20] measured the relative time required for the effective stroke as compared to the stroke of recovery and found the ratio was 1:3;

others have estimated it as being as high as 1:5. Accepting the figure of 1:3, this means that the effective stroke occupies only one fourth of the time and that the blanket is moved the 2.0 microns during 0.004 of a minute. This alone would account for a velocity up to 8 millimeters per minute; still not high enough.

In thinking about it, one realizes that during this 0.004 of a minute, the tip of the cilium starts from zero velocity, accelerates to a peak velocity, decelerates again, and comes to a complete stop. It is quite likely that the peak velocity would be at least twice the average velocity of the movement. If the tip of the cilium is in contact only, or nearly only, during its peak velocity, this would then boost the rate to 16 millimeters per minute, which is about the upper range found. Presumably the tips of the cilia are in contact with the blanket only during the effective phase, when in the erect, or almost erect, position. During the phase of recovery, they are bent down in the watery layer of secretion surrounding the cilia, according to Lucas.[68] Each cilium is just a little bit ahead in the phase of the cycle of the one immediately behind; this would mean that the waves formed progress in the reverse direction of the mucous flow. Proetz pointed this out many years ago.[76] Meanwhile, the blanket is dragged, as it were, upon the watery layer, from crest to crest of the waves formed by the tips of the cilia. Incidentally, since, during the active stroke, the tip of each cilium is separated from those following it, because it is ahead in the cycle, so, during the phase of recovery, the tips might pile one upon the other during that part of the cycle when the cilium is again returning to an erect position.

Friction Factor

At first thought, 1000 cycles a minute conjures up in the mind a powerful churning of the cilia against great friction; as a matter of fact, the linear velocity of the tip of the cilium at its peak is relatively low, probably not over one meter per hour. At this velocity, a change is directly proportional to the force instead of the square and the friction factor would be exceedingly low. So both the moving, slippery blanket and the cilia, whipping in a watery fluid, move almost without friction.

EXPOSURE TO INHALED CARCINOGENS

The squamous cell carcinomas, which have increased so greatly in number in the last generation, occur by predilection in the root of the lung.[70] It would be of interest and importance to know if the major exposure to inhaled carcinogenic substances occurred from the initial deposit during inspiration or if the exposure is greater from the drainage from the wide peripheral areas of the lung. It would be important to know, for instance in the case of cigarette smoke, if the concentration in the mucous blanket of the initial deposit is the same or very much less than that which flows in from the periphery. The relative time of exposure also would be a most important factor. All of these problems are closely related to several factors: the relative rates of flow in the periphery as compared with that in the main bronchi, the relative depth of the mucous blanket in the periphery as compared with the main bronchi, the total quantity of respiratory mucus produced, and the regions where the mucus is produced. Is most of the mucus normally produced in the periphery simply drained out through the bronchial tree? Or is the blanket normally added to continuously by the underlying glands in the mucosa as it passes from the bronchioles to the larynx? Undoubtedly this would depend upon conditions at the moment. The production of respiratory mucus can in-

crease enormously under drug stimulation[9-11,14] or irritation from the commonly experienced respiratory diseases.

Since the increased incidence of malignancy in the respiratory tract has been linked with the smoking of cigarettes, it is important to understand what happens to the smoke from cigarettes in the lower respiratory tract, how it is handled by the drainage mechanism, and what effect it has on physiologic processes and on the morphology of the lining epithelium.

a great deal less than that in the trachea (figs. 2 and 3). The time of exposure might vary considerably in different areas.

SPEED GRADIENT OF CILIARY STREAMING

Ciliary streaming in the nose exhibits two types of speed gradient in its flow. In the anterior third of the nose, the flow rate is only a fraction of that in the posterior two thirds. This is because the epithelium in the anterior third is largely nonciliated and the mu-

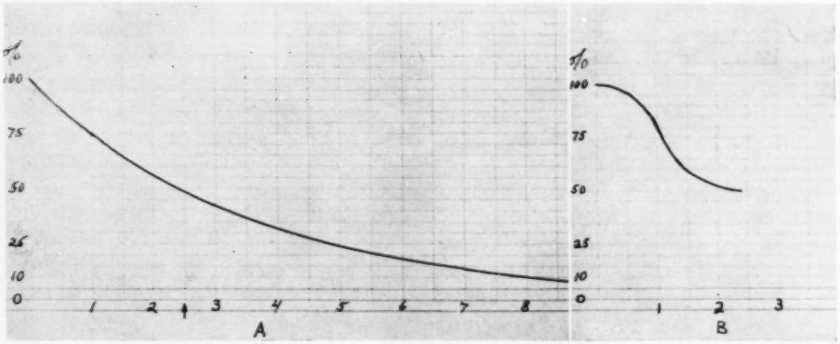

FIG. 2—(A) Type of curve representing rate of deposition of a suspension, such as cigarette smoke, completed in 10 seconds, through a uniform system. This is incorrectly given as the type of curve in the bronchial tree in a previous article.[52] Since the bronchial tree is not a uniform system, but divides into a great many small branches, and since the air flow occurs down and back, it is more likely that the rate of deposit during the 2.5 seconds of a smoker's "drag" would be represented by a curve such as that depicted in (B).

In ordinary smoking, roughly half of the smoke is deposited in the tract; but to say that, doesn't quite give the picture. Since half of the smoke returns,[49] it follows that exposure of the lining of the tract to smoke is not confined to inspiration but takes place during expiration as well, and that the trachea is subjected to somewhat more than half the exposure in expiration than it was during inspiration. It also follows that the peripheral air passages are subjected to a concentration during inspiration not

cous blanket is drawn off by traction. There is a gradually increasing rate of flow in the sinuses, beginning with a point most distant from the ostium (as far as drainage is concerned) and increasing in rate progressively as the ostium is approached. It may begin at 1 or 2 millimeters per minute and pass through the ostium at 15 millimeters or better.[35,37-39,40,42] This arrangement may explain the fact that secretion drained from a relatively large area through a small ostium does not pile up at the

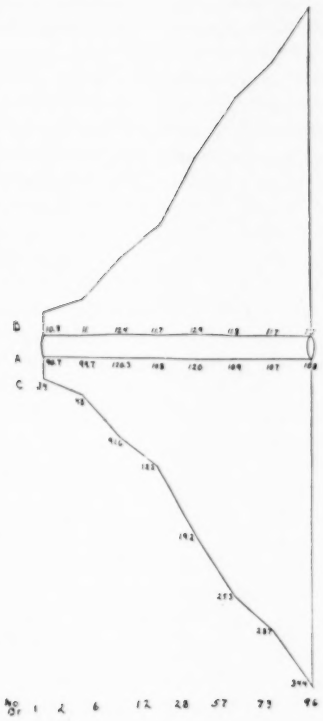

FIG. 3—Graph representing the increased area of epithelium available for deposition as the periphery is approached. Composite measurements at eight successive levels of the bronchial tree of the left lower lobe from a man 34 years of age. The progressive increase in volume was quite small in this case, as indicated by the increase in cross-sectional area from 90.7 to 108 square millimeters. The increase in the area of mucous membrane, on the other hand, was very striking. The total of the added circumferences increased tenfold between the first and the eighth levels. The specimen was a good one and it was possible to measure the bronchi down to an average diameter of 1.12 millimeters. (The figures on the left represent the left lower lobe bronchus. D=calculated diameters of the composite single tube having the same volume at the various levels as the bronchial tree. A=summations of the calculated cross-sectional areas of the bronchial tree at various levels. C=summations of all measured circumferences at the eight successive levels. No. Br.=number of bronchi measured.[58] (Reprinted through the courtesy of The Annals of Otology, Rhinology and Laryngology.)

ostium. How this gradation of rate is effected is not known. All areas seem to be equally well ciliated.

Is there a similar speed gradient in the lower respiratory tract, where also a very large area must drain through a relatively narrow channel, the trachea?[26,31,82] One would expect that this might be the case, and I have made a number of attempts to determine whether the rate of flow in small bronchi actually is considerably less than that in the trachea. The question is a simple one, but obtaining the data to answer it is anything but simple; in fact, it is most frustrating. I have tried measuring it in cats under anesthesia and also immediately after death, as well as in living, anesthetized sheep, and in calves within

minutes after their death. Remembering that Dalhamn[20] found that the transport of mucus in the trachea of rats ceases within six or seven minutes after death (although the cilia keep beating), one cannot place much confidence in postmortem measurements, no matter how soon and how quickly they are made. Perhaps the transport of mucus stops earlier in the small branches than in the larger ones. If so, this might give a false figure even though the rate of flow in the trachea at the same moment had not yet abated. Any approach that can be made in the living animal greatly alters physiologic conditions. First, the anesthetic may affect the rate of flow and volume production of mucus, as may the necessary elaborate operation of thoracotomy. Bleeding must be controlled before the small bronchus being examined is opened, because blood in the lumen interferes with measurements of flow rates. Once the bleeding has been controlled, it is quite possible that the measures employed in so doing have also greatly altered the production of mucus and rate of flow.

In the sheep that were tried, almost immediately a frothy secretion developed; this occurred despite the fact that the anesthetic was given intravenously. The few data obtained indicate that the rate of flow in the small bronchi is much less than in the large ones (table I). These few data cannot be considered reliable; yet, the probability remains that there is such a speed gradient in the bronchial tree. If there were not, the secretion would tend to pile up in the narrow stream-bed of the primary bronchi.

MUCOUS VOLUME

Some investigators have questioned whether cigarette smoke could have caused the present increase in the incidence of bronchial carcinoma on the grounds that the incidence of oral carcinoma should be much higher than it is,

TABLE I

DATA INDICATING A VELOCITY GRADIENT IN THE CILIARY STREAM. IT SEEMS TO FLOW MORE SLOWLY IN THE SMALL BRONCHI THAN IN THE LARGE BRONCHI OR IN THE TRACHEA.

ANIMAL	STATE	RATE OF FLOW (MM.) BRONCHI SMALL	BRONCHI MEDIUM	BRONCHI LARGE	TRACHEA	REMARKS
Sheep 2	Live		1.8 1.3 1.3		6.0 10.0	Excess secretion
Sheep 3	Dead		1.0	2.8	6.0	Immediately after death; blood in trachea
Calf 85	Dead			11.0	14.0	Immediately after death
Cat 44	Dead	0.05 0.16		11.0	7.5	Immediately after death; damage by intratracheal tube
Cat 54	Dead	0.40	1.2	2.0	10.0	Immediately after death

inasmuch as the mouth receives the concentrated, undiluted, initial charge of smoke. Why isn't the increase in the incidence in the mouth greater than in the lung? This is a fair question. If conditions were similar in both locations, there should be a greater incidence in the mouth; however, conditions are not similar.

Several differences immediately come to mind. The mucosa in the two locations is architecturally different: that in the mouth is thick, leathery, and constructed to tolerate considerable physical and chemical abuse; that in the bronchial tree is thinner, more delicate, and more easily disrupted.

The relative quantities of secretion in which deposition takes place is an important factor. Man produces 1500 cubic centimeters of saliva in 24 hours,[7] and no doubt smokers produce more. Any deposit occurring upon the relatively small area within the mouth must be very quickly washed away. What is the volume of respiratory mucus produced by man in 24 hours? This is unknown, but it is probably only a fraction of that of the saliva. Fifteen or twenty years ago a group of pharmacologists led by Boyd[9-13] worked on this problem, with special reference to the effect of a large series of drugs on the production of respiratory secretion. Their tests were made on rats, guinea pigs, rabbits, cats and dogs. Their technique was to cannulate the trachea and collect the secretions coming through the cannula; meanwhile the animal was anesthetized and breathed warmed and moistened air through the cannula. The figures obtained in their studies seem surprisingly high but may be correct. They found that cats secreted approximately 0.2 milliliters per kilogram of body weight each hour (a variation from 0.05 to 0.47); rabbits secreted about half that amount, and dogs secreted about 0.5 milliliters per kilogram of body weight during an equal period of time. However, the variations were great, normally being as much as tenfold. Some of the drugs increased the production of respiratory secretion 1000 per cent.

The difficulty with all of these experiments is that physiologic conditions are disturbed. These workers reported that the secretion was increased through reflex action by artificial stimulation of the peripheral cut end and the proximal end of the vagus nerve. Florey[31] also found that vagus stimulation greatly increased secretion, as did surface irritation and dry air. In Boyd's experiments, how much the surgical manipulation and the cannula resting against the mucosa increased normal secretion is problematic. Applying the findings of Boyd and his colleagues to man on a body weight basis (per kilogram of body weight), the results varied from 30 to 600 milliliters per 24 hours for a man of average weight. Dalhamn[20] mentions that the total volume of mucus in the entire trachea of a rat is equal to one cubic millimeter; just how this was determined is not stated.

As was the case with attempts to measure the speed gradient, I have made some trial studies to measure the production of mucus in the lower respiratory tract in several animals.

Mucous Volume Experiments

In Cows.

Such an experiment was done on each of 9 cows immediately after death. The workmen at the packing plant cooperated in this study so that in less than two minutes from the time the animal was killed by a shot to the head, the trachea was exposed, transected just below the larynx, and capped with a plastic bag. The carcasses then went through the regular assembly line and, after 25 or

30 minutes, the entire respiratory tracts were recovered, placed in plastic bags and brought to the laboratory, where at the end of six or seven hours, the mucus was collected at the cut end of the trachea and weighed. The experiment was successful in only three animals. The others were invalidated either because the bag slipped off, blood gained access, or some pathologic condition produced a purulent secretion. In the successful experiments, one produced a mere 0.32 gram in six hours; and one, 0.44 gram in seven and a half hours (table II).

In Guinea Pigs.

Attempts were made to measure the mucous volume in the lower respiratory tract in guinea pigs, but the results were unsatisfactory.

In Hens.

The hen is a very satisfactory animal for this type of experiment. The trachea is long and easily accessible. Five experiments were done on hens in such a way as to keep the animal breathing through the normal upper air passages.

TABLE II

WEIGHT OF MUCUS CARRIED TO THE TRANSECTED END OF THE TRACHEA FROM THE RESPIRATORY TRACTS OF 3 COWS IN THE HOURS IMMEDIATELY AFTER DEATH. THE EXPERIMENT WAS BEGUN WITHIN 2 MINUTES AFTER DEATH. (THE EXPERIMENT WAS ATTEMPTED UNSUCCESSFULLY IN 6 OTHER COWS.)

ANIMAL (COW)	TIME IN HOURS	TISSUE	WEIGHT OF MUCUS (MG.)	REMARKS
146	6.0	Entire tract	326	About ¼ blood
147	7.5	Entire tract	443	
148	7.0	Entire tract	357	

The cow normally produces 60 liters of saliva in 24 hours.[7] Comparison with the volume of saliva is difficult. Did the lungs produce any mucus in addition to that which was present at the moment of death? I don't know. How long did it take to produce that which was present at the moment of death? I don't know. How much of that present at the moment of death was transported to the end of the trachea? Again, I don't know. I do know that several complete trips for the full length of the trachea can be visualized in the first three hours after death if one applies indicators to the mucous blanket. If the whole mucous blanket at the time of death is transported by the cilia, there would seem to be ample time for it to reach the end of the trachea.

Technique: Under pentobarbital anesthesia,* the trachea was exposed for about two thirds of its length. It was isolated from the surrounding tissues by incising the thin fascia along the anterior wall and separating this, together with the vessels which it contained, all the way around the circumference. Stay sutures, of either catgut or silk, were placed in the trachea across the line to be transected in such a way as to limit the retraction to 15 to 20 millimeters. A

*In the form of Somnopentyl. Each cubic centimeter contains: pentobarbital sodium U.S.P. (recrystallized) 1 gr.; hydroalcoholic diluent q.s. Furnished for this research work through the kindness of Pitman-Moore Company, Division of Allied Laboratories, Inc., Indianapolis.

cuff of wax paper was wrapped around the trachea. The level to be transected was thoroughly desiccated before opening, in such manner as to destroy the vessels and prevent bleeding. Transection was then carried out at this zone and the cuff of wax paper was tied around the separated ends of the trachea to form a tube for breathing. The fascia and skin were closed over the trachea and its sleeve of wax paper. This method permitted respiration to take place normally through the upper air passages, the only abnormal feature being the gap between the transected ends of the trachea where the sleeve of wax paper formed the air passage. The experiment lasted one hour, during which time any mucus carried from the lower tract and through the trachea collected at the desiccated line of transection, as at an obstruction. At the end of one hour the experiment was terminated and the specimen, consisting of the sleeve of wax paper and both cut ends of the trachea, was recovered. The mucus was collected on a tiny, short swab with the aid of forceps. The swab was promptly placed within a gelatin capsule and weighed. The capsule and swab had been previously weighed dry, and the gain in weight of the swab represented approximately the weight of mucus brought to the cut end of the trachea during the one hour. It undoubtedly included a little serum and a little blood, and there was perhaps a little loss of mucus. On the other hand, some of the fluid recovered upon the swab from the waxed-paper sleeve was undoubtedly condensation, even though the skin had been closed over the trachea and sleeve during the experiment. It looked like condensation because it occurred in discrete droplets in the wax paper sleeve, while the mucus stopped at the cut end (table III). Boyd states that the tubing in his experiments was insulated and, therefore, condensation was obviated. Since the normal mucus in the mucous blanket is quite viscid and scanty, one would suspect that, despite his insulation, the secretion that flowed through his glass tubing was partly condensation.

TABLE III

WEIGHT OF MUCUS CARRIED TO THE TRANSECTED END OF THE TRACHEAS IN 5 LIVING HENS UNDER ANESTHESIA.

ANIMAL (HEN)	TIME IN HOURS	WEIGHT OF MUCUS (MG.)	WEIGHT OF HEN (GRAMS)	REMARKS
2	1	35.3		
3	1	15.0		
4	1	34.9		
5	1	107.3	2210 (4.86 lb.)	
6	1	33.0	1430 (3.15 lb.)	

Again questions arise. Did the anesthetic increase or decrease the production of mucus in my experiments? Did the tracheal manipulation, including desiccation and transection, stimulate pro-

duction of mucus reflexly? This seems possible. It is quite possible that parasympathetic branches were stimulated. Is the respiratory mucus in avians proportionate by weight to that in mammals? I don't know.

In Man.

My only opportunity to study the volume of mucus in living man was in the case of a laryngectomized nurse. She explained that one of the worst features of losing one's larynx is the increased production of mucus. Presumably this is a defense measure on the part of the respiratory tract, since the air-conditioning function of the nose has been eliminated. As time goes on, the production of mucus lessens, until, under favorable circumstances, there does not seem to be an excess.

The test was made on September 14 at room temperature, over a 3-hour period. The relative humidity of the atmosphere within the building during the three hours was 65, 71 and 74 per cent. During this time 1.16 grams of mucus were produced; on a 24-hour basis, this would be 9.28 grams. The nurse explained that under certain circumstances, she produces many times this volume.

Summary: Mucous Volume

In summary, the data gained from the experiments on the volume of respiratory tract secretion show a wide variation. In general, they indicate that the volume produced under normal physiologic conditions is relatively small —much less than the volume of saliva. This could very well be one factor accounting for more carcinoma in the lungs than in the mouth. The differences in composition of saliva and respiratory secretion might also be a factor.

COMPARATIVE DEPTH OF MUCOUS BLANKET

Related to the velocity of ciliary streaming and the amount of mucus produced is the relative depth of the mucous blanket in various portions of the tract. Since a wide area drains through the comparatively small channels of the main bronchi, it would follow that the depth of the blanket in the main bronchi would be much greater than that over the large area from which it is accumulated, unless the velocity of flow is sufficiently greater in the main bronchi to neutralize the effect of the greater tributary area. The difference in the velocity would have to be great, indeed, to prevent an increased depth of the blanket, even though no more mucus were added en route from the periphery. How much is added en route I do not know. This would undoubtedly depend upon circumstances.

Why be concerned about the difference in depth in the various portions of the tract? Does it matter? It could be of great importance as far as the concentration of pollutants in the mucous blanket is concerned.

IMPORTANCE OF RETURN FLOW

Again, referring to cigarette smoke, which, in ordinary smoking, travels all the way down with the inspired air and all the way back, depositing continuously in both directions: If a given number of tar droplets are deposited initially in a unit square area in the main bronchi during inspiration, then there would be deposited on the same area in the bronchioles the same number minus some loss from the deposition already made. If the depth of the blanket in the tiny bronchioles is only one tenth, one fiftieth, or one hundredth as great as in

the main bronchi, then it would mean that the concentration of the pollutants in the ciliary stream coming from the periphery would be correspondingly greater than that in the initial deposit in the main bronchi during inspiration (fig. 4). It may well be that the concentrations, as well as the quantity, of the pollutants in the mucus flowing from the periphery through the main bronchi are many times greater than those that were deposited initially. Moreover, that which was deposited initially is moved off with relative promptness. No one knows for how long a period the more concentrated mucus from the periphery continues to flow through the main bronchi.

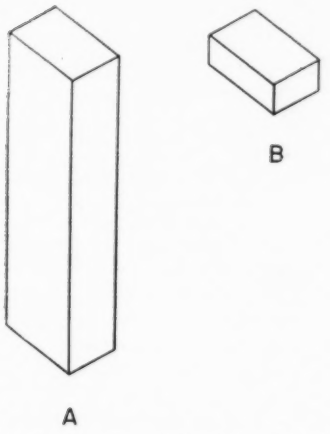

FIG. 4—Graphic representation of the effect of the depth of the mucous blanket on the concentration of deposited pollutants (tar droplets) in the mucus. If A should represent the depth in the main bronchi and B that in the terminal bronchioles, the deposition of approximately an equal number of droplets on the top surface area would result in a much higher concentration in B.

The more one ponders the problem, the more unanswered questions arise. If the concentration per cubic volume is greater in the periphery, why do the carcinomas occur by predilection in the root of the lung? How much of any given pollutant is absorbed and how much returns in the mucous blanket? What are the manifold effects of the numerous different toxins found in cigarette smoke? What is the rate of deposition of the many compounds contained in smoke? The answers to most of these questions seem to be largely unknown.

Some years ago, I found that cigarette smoke in relatively small concentrations stopped ciliary action in vitro.[50] Dalhamn pursued this matter further in the living rat under near physiologic conditions and confirmed the finding.[22] Moreover, he found that such concentrations as occur in ordinary smoking were sufficient to stop or very materially slow the ciliary action in a large percentage of the animals studied. Falk and his coworkers[28] and Ballenger[5] also have confirmed the finding. The latter, by the ingenious use of the power of cilia to rotate masses of tissue in vitro, has quantitated this toxic effect.

Which toxin or toxins are responsible for this effect? Nicotine, arsenic, and furfural, among others, come to mind. It is possible that the deposition of whatever retards or stops ciliary action occurs largely during inspiration, thus having a greater effect on the main bronchi than in the periphery. Such a differential of deposition could possibly account for the predilection of squamous cell carcinoma to locate in the root of the lung. Of course this is pure speculation; the matter is probably far more complex than this.

In any case, we would like to know the relative depth of the mucous blanket in the small and large bronchi, but this is not an easy measurement to make. Again, referring to Dalhamn,[20] by means of a freeze-drying technique, he measured the depth of the mucous blanket in

normal tracheas and those which had been exposed to irritating gases. Presumably the same technique could be used to determine the relative depths in the different portions of the tract. I have tried to do this but thus far have not succeeded. The freeze-drying technique is not something read about one afternoon and done successfully the next morning.

DRAINAGE OF AIR POLLUTANTS

Below the Respiratory Bronchioles

How is drainage of air pollutants distal to the headwaters of the ciliary stream accomplished? Ciliary streaming begins in the respiratory bronchioles. We know, of course, that some pollutants deposited beyond this point are taken into the lymph stream and regional lymph nodes. Huppler[59] has demonstrated that mucous secretion distal to the ciliary mechanism may be removed by phagocytosis. Mellors[69] has shown that at least some of the cigarette tar is picked up in the alveoli by ameboid pneumocytes, which then carry the tar into the respiratory bronchioles and there disintegrate, depositing the tar. It would be interesting to know how much is removed in this way. Incidentally, any deposits made in the respiratory bronchioles by the pneumocytes would add to the already high concentration there.

Peristalsis

Although the evidence is not convincing,[23] it has long been believed that peristaltic action in the bronchioles aids in drainage of the tract.[78] I have never been convinced of this, but certain it is that both longitudinal and transverse smooth muscle is found in the walls of the smaller bronchi located on the inside of the cartilages. One wonders what the function of these muscles may be if there is no peristalsis. In healthy, fresh specimens, the epithelium of the small bronchi is often folded so that in cross section it describes a star formation. Is this due to muscular action, and what is the purpose of this infolding? Is it to ensure further conditioning of the inflowing air? Could it be that here, where the cilia are short and sparse, drainage is better accomplished between apposing surfaces? Does the infolding of the epithelium in the small bronchi vary during the respiratory cycle?

DAMAGE AND REPAIR OF THE CILIARY MECHANISM

Of more immediate interest to otolaryngologists, endoscopists, anesthesiologists and thoracic surgeons is the matter of the tolerance of the ciliary mechanism, especially in the trachea, to mechanical manipulation. How much swabbing, how much instrumentation, how much drying will this mechanism tolerate and how long does it take to repair and recover?[33] Specialists in these fields of medicine are all familiar with the reaction that not infrequently follows the use of intratracheal tubes in anesthesia. How much of this reaction could be avoided by improvement of methods?

I believe that considerable improvement could be accomplished. Turbulence of air flow is produced beyond the tip of the tube, the degree depending upon the relative diameters of the tube and the trachea, together with the velocity of flow of gases. Drying would depend upon the relative humidity of the gases used, and mechanical damage would depend, in some measure, on the physical nature of the tube, the depth at which it is placed, the gentleness with which it is handled, and the relative motion between the tracheal wall and the tube. I feel strongly that this problem must be thoroughly investigated in order to relieve unnecessary reactions and to aid

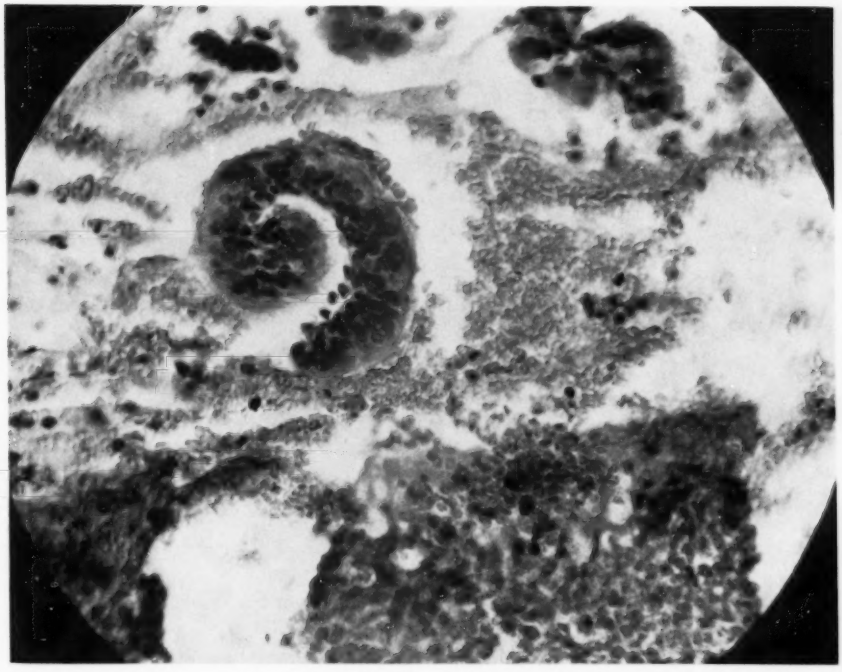

FIG. 5—Masses of desquamated epithelium found in accumulated exudate that lodged at the level of the tip of an intratracheal tube used during anesthesia.

in postoperative recovery. I have begun such studies but have not yet carried them far enough to make positive conclusions. That damage can occur is illustrated by one experiment in which a cat was thoroughly examined after intubation of one and a half hours. Probably the changes are much greater than those which occur in patients (fig. 5).

It is well known that epithelial cells are readily dislodged from the nasal mucosa. Living cells have been removed, studied and photographed, both in still and motion pictures, by many workers over the years.[15,43] The resulting damage is not thought to be very serious and repair seems rapid. How much will the tracheal mucosa tolerate? How soon does surface damage repair?

Experiments: Damage and Repair

As a beginning, a series of simple experiments were done in the packing plant on the tracheal mucosa in a series of beef animals immediately after death. These experiments have consisted essentially in passing 3-millimeter cotton swabs over the surface of the trachea once. The swabs were weighted in such a way as to deliver a known, given amount of pressure.

Technique.

The tracheas were recovered on the

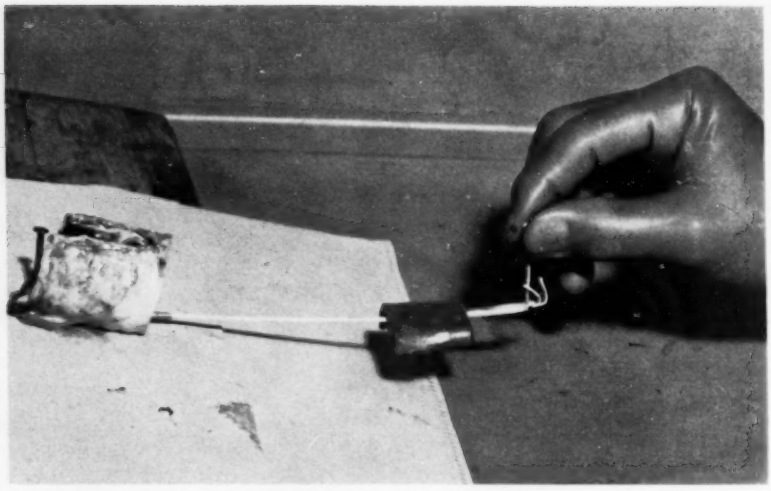

FIG. 6—Method of making predetermined pressure with a swab as it was passed along the anterior midline of a cow's trachea.

killing floor as soon as practicable after death and were cut into sections 8 or 10 centimeters in length, avoiding the areas of transection made on the killing floor. Five different swabs were used a single time in as many tracheal sections. The piece of trachea was held at an angle of fifteen or twenty degrees; the swab was held by a thread in a horizontal position and then slowly dragged axially along the anterior midline of the mucosa (fig. 6). The weights delivered by the swabs were 5, 10, 25, 50 and 100 grams respectively. Immediately after

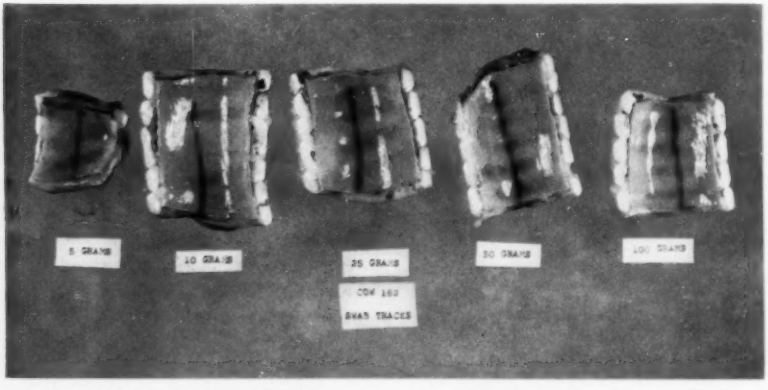

FIG. 7—Methylene blue stain indicating the damage to the mucosa produced by passage of swabs of the indicated weights, in the trachea of a freshly killed cow.

passage of the swab, the area was stained with methylene blue for 30 seconds and inspected and photographed grossly (fig. 7). The pieces were then put in formalin for histologic study and smears were made from the swab.

Results.

The damage seen both grossly and histologically varied considerably between animals. An excess of mucus had an obvious protective effect. However, in most animals, damage was readily apparent from all the swabs, even that weighing 5 grams, as evidenced grossly by the scratch-like track left by the swab. Fresh mucosa does not stain much with methylene blue; a relatively small number of scattered cells take the stain. In contrast, where the swab had passed, all, or nearly all, of the cells took the stain and, under the Greenough microscope, the damage could be seen and assessed. It varied from surface scratches to gouges going to, or even through, the basement membrane. The damage was not uniform along the track.

Histologically, the damage was not always demonstrable. Apparently many of the cells that had been more or less crushed resumed their original shape and showed little change. In general, the changes seen were, first, loss of cilia; then loss of the cytoplasmic zone in the distal ends of the ciliated cells; then, as the damage increased, greater loss of the replacement cells; and finally, tearing of the basement membrane.

METAPLASIA

Another big problem is that of metaplastic changes in the epithelium. Carcinoma is thought to begin in such altered areas. What causes squamous cell metaplasia in presumably healthy people? Of course Vitamin A deficiency will cause it,[30,92] but that would scarcely account for most of that which is found.

Possible Relation to Ciliary Streaming

Correll and Beattie[17,18] produced metaplasia experimentally, by accident, in reversing the trachea in dogs. Squamous epithelium developed along the line of transection where the mucous blanket was drawn away in both directions. They had difficulty keeping their animals from asphyxia due to accumulations of secretion at the lower transection. Attempting to obviate this difficulty, I tried a modification by rotating an isosceles triangle of tracheal wall through 120 degrees in a series of three calves. They were allowed to live 25, 56 and 61 days respectively. These experiments failed to produce squamous epithelium. The triangle of wall became more or less rounded, the cartilage did not heal, and the area moved in and out with respiration. Marked scarring developed, and histologic examination showed marked inflammatory reaction with epithelial changes due to this reaction. Although the epithelium was neither ciliated nor columnar, the change could not be classified as squamous metaplasia.

The experiment was also done in a series of rabbits with unsatisfactory results.

Another attempt was made to produce a transverse-lying crescentic scar in the tracheas of two calves. Such scars, with knife-like edges, can be developed upon concave surfaces within the sinuses of dogs by removing rectangles of epithelium.[46] They will interrupt ciliary streaming. The object of these experiments with calves was to determine whether the epithelium on the scar would be metaplastic. Scars which formed caused some deformity of the trachea, but they were not sharply elevated and on histologic examination, like the previous specimens, showed a marked inflammatory reaction with pronounced changes

in the epithelium that were the result of inflammation.

From a somewhat different standpoint, I am making another trial in calves that may succeed. The bovine trachea has an anatomical peculiarity that lends itself to my purpose. However, a difficulty is presented in using these animals: these experiments should run for many months; it is one thing to give an intravenous anesthetic to a newborn calf weighing 60 or 70 pounds, but it is something else again to repeat the anesthetic on a 300 to 500 pound healthy young bull.

SUMMARY

The increased incidence of carcinoma of the bronchial tree has emphasized the fact that many important details of the normal and pathologic physiology of the respiratory tract are still obscure.

The incidence of carcinoma and its predilection for the large bronchi are undoubtedly dependent upon the application of effective dosage of air pollutants (including cigarette smoke) to a given area of the mucosa. This, in turn, would depend upon the mucous volume, the concentration of the pollutant in the mucous blanket, the duration of application, and the character of the mucosa in the area.

The rate of flow in the small as well as the large bronchi would determine the duration of exposure. If the flow in the small bronchi is only a fraction as fast as that in the large, the time of exposure would be prolonged, as the flow from the periphery comes into the large bronchi. The total volume and the relative depths of the blanket in which the pollutant is deposited would determine its concentration. The concentration in the small bronchi might be many times greater than that of the initial deposit in the large bronchi if the mucous blanket is relatively shallow in the small bronchi.

The rate of flow of ciliary streaming in the lower respiratory tract (trachea) may be as high as 15 millimeters per minute. This relatively high velocity of flow seems to be attained because the ciliary tips that move the blanket are in effective contact only during the effective phase, and probably only during the peak velocity in that phase.

It is probable that the velocity of flow varies in the different parts of the lower tract, as it does in the upper respiratory tract. The few data at hand indicate that the flow is at a considerably lower rate in the small bronchi and that it accelerates as the trachea is approached.

The normal volume of secretion in the mucous blanket in man is unknown. Attempts to determine it in animals have been made and some data obtained. In animals the volume appears to be scanty and is a small fraction of the volume of the saliva. The same probably obtains in man.

It is difficult to obtain accurate data on the comparative depths of the mucous blanket in the different portions of the tract. It is probable that the depth of the mucous blanket in the small bronchi is only a small fraction of that in the main bronchi. Under the microscope it appears to be deeper. Herein probably lies the key to the concentration of pollutants in the ciliary stream in the main bronchi.

Experiments demonstrate that the mucosa of the lower respiratory tract is readily traumatized, a fact which should be borne in mind by those who subject it to manipulation during endoscopy and surgical procedures. Apparently it repairs readily, but every effort should be made to minimize trauma.

The causes of metaplasia are many. Inflammatory metaplasia is readily produced experimentally, but squamous metaplasia is not so easily produced. The cause of the latter, when found in otherwise normal people, is obscure. Metaplasia begins in the basal layers and is not dependent on damage to surface layers. If carcinoma does not begin in pre-existing metaplastic areas, it at least seems to go through the stages of metaplasia in its development.

In closing, it might be stated that many more problems have been raised than solved. When information necessary to answer these questions is available, we will have much more knowledge of the genesis of bronchial carcinoma and metaplasia, as well as of the tolerance of the mucosa to trauma.

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COMBINED RADIATION AND SURGICAL THERAPY FOR CANCER OF THE LARYNX AND LARYNGOPHARYNX

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BY INVITATION

NEW YORK, NEW YORK

THE treatment of carcinoma of the larynx has reached the present stage of achievement after a century of growth in techniques, concepts and appreciation of the problem of cancer. The heart-warming fact is that laryngeal cancer, with uterine cancer, can claim the highest survival rates, excepting, of course, skin cancer. It is of interest, also, that cancer of both these organs has been attacked successfully both by surgery and by radiation therapy separately.

The first laryngofissure operation for laryngeal cancer was performed by Gordon Buck in 1851 in this country. The first total laryngectomy was performed by Billroth in Vienna in 1873, and this surgeon also is credited with the first hemilaryngectomy in 1876.

Radiation therapy in the form of radium needles was first used in the early 1920's, and was followed shortly by the application of radium plaques and bombs. Many of the tissue reactions and difficulties resulting from these forms of radiation were obviated when Coutard introduced the protracted fractional method of radiation, which is still the basis of the method of radiation therapy employed at present for laryngeal cancer.

Surgical progress in the past decade especially has been concerned with wide-field extirpation of the larynx in association with radical neck dissection. In the laryngopharyngeal lesions, the swing has been from the obligatory to the elective radical neck dissection.

It seems fair to state that the techniques in surgery and radiation therapy[1] have reached a peak of accomplishment. As will be shown later, in uncomplicated lesions limited to the interior of the larynx, the survival rates have been very gratifying with either modality. However, in the group of patients with laryngopharyngeal and extensive laryngeal cancer both surgical resection and radiation therapy have yielded comparatively much poorer results and should present a challenge both to the laryngeal surgeons and to the radiotherapists. In fact, it is our thesis that further progress in the treatment of laryngeal cancer for lesions which today offer a poor prognosis might be accomplished by a program of combined radiation therapy and surgery.

Our opinion on this subject undoubtedly has been influenced by our favorable experiences with radiation therapy alone. These impressions have been formed from our active association in radiation therapy for laryngeal cancer for almost three decades. The treatment by radiation therapy of patients suffering from laryngeal cancer was begun at The Mount Sinai Hospital in 1931 by

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Dr. Rudolph Kramer and Dr. William Harris.[5,6] Since then, 312 cases in which radiation was the primary form of treatment have been studied. This series is comprised of patients from the Otolaryngological Service and from the private practices of members of the staff of The Mount Sinai Hospital. We shall present the statistics of the most recent analysis of these cases to show that radiation therapy has the potential to play an important, active role in the treatment of laryngeal cancer, either alone or in association with surgery, and should be regarded as an effective modality in its own right.

We wish to state emphatically that success with radiation therapy requires expert management by those who are well trained and highly experienced in this field and who have the proper radiation facilities. Inexpert radiation therapy has no place in the treatment of laryngeal cancer and certainly is no substitute for surgical resection.

PROGNOSIS

The prognosis of patients with carcinoma of the larynx, regardless of the kind of therapy used, depends upon many factors, but especially on the location of the tumor. The site of each laryngeal lesion should have a significant bearing on the choice of therapy that should be recommended. For instance, we believe that the time has come when radiation therapy should be the preferential primary form of treatment for the cordal carcinoma suitable for partial laryngectomy. Also, we have shared the impression that surgery has been more effective as a primary method of treatment for laryngopharyngeal lesions, although our radiation results for these neoplasms do not support this contention. However, it is our opinion that the future successful management of these cancers will depend more on a combination of radiation and surgical treatment than on either form of therapy alone.

Briefly, the most important single factor in prognosis is involvement of the cervical lymph nodes, which is dependent chiefly on the site of the primary tumor. Among others, Pietrantoni has demonstrated this fact in his analysis of 465 consecutive cases of carcinoma of the larynx.[22] He showed that only 0.4 per cent of cordal lesions had metastasis in lymph nodes; while in the extrinsic carcinomas, metastasis could be demonstrated in the lymph nodes in 35 to 76 per cent of the cases depending on the anterior and posterolateral sites of the primary lesion. The presence of positive lymph nodes in radical neck dissection specimens has diminished the chances of survival in all series reported. Thus, the need for radical neck dissection when nodes are present, and even when they are not palpable in cases which offer a bad prognosis, has become clear.[3,15,16,24,26]

CLASSIFICATION

The literature on carcinoma of the larynx and laryngopharynx contains numerous and varied classifications. It is difficult to evaluate and compare statistics and results because of the lack of general agreement. We are adhering to the classification presented by our original authors (Harris, Silverstone and Kramer[5,6]) for the reason that it is based upon the practical aspect of prognosis, which has an important bearing on the ideas which we are presenting.

Our cases are divided into two major groups: the larynx proper or intrinsic larynx and the laryngopharynx or extrinsic larynx. The intrinsic larynx includes the vocal cords with the adjacent ventricular area above and subglottic area below and the anterior and posterior commissures. The laryngopharynx includes the false cords, epiglottis, ary-

epiglottic folds, arytenoids, pyriform sinuses and postcricoid region.

We have further subdivided our intrinsic laryngeal cases into those which could have been treated properly by partial laryngectomy and those which would have required laryngectomy. We are aware that there are some laryngologists who would perform a hemilaryngectomy in certain cases in which others would prefer total laryngectomy.

In the laryngopharynx, we have found a marked difference in prognosis between the *anterior lesions,* which include the epiglottis, false cords and upper half of the aryepiglottic folds, and the *posterolateral* lesions, which include the lower half of the aryepiglottic folds, arytenoids, pyriform sinuses and postcricoid region. Wherever possible, the laryngopharyngeal lesions were classified into these two groups. However, there were *extensive lesions* which involved both anterior and posterolateral areas, and such cases were classified separately as the *extensive* group.

RESULTS OF RADIATION THERAPY

From 1931 to 1959, 312 cases of carcinoma of the larynx and laryngopharynx were treated by irradiation. Of these, 179 were intrinsic and 133 extrinsic. Of the 179 intrinsic lesions, 68 were suitable for partial laryngectomy, while 111 would have required total laryngectomy. Of the 133 extrinsic lesions, there were 59 in the anterior group, 40 in the posterolateral group, and 34 in the extensive group.

Of the 68 cases of carcinoma limited to the vocal cord and suitable for partial laryngectomy, there were 43 treated from 1931 to 1954 and therefore were available for five-year study. Of these 43 cases, nine were indeterminate, three patients having been lost to follow-up and six having died from other causes, but none showed evidence of disease when last seen. Of the 34 determinate cases, there were 30 five-year survivals, a determinate survival rate of 88 per cent. If the indeterminate cases are regarded as failures, the absolute five-year survival rate was 70 per cent.

Of the 111 cases of carcinoma of the intrinsic larynx that were suitable for laryngectomy, 94 were treated from 1931 to 1954 and therefore were available for five-year study. Of these 94 cases, 21 were indeterminate, 10 of the patients having been lost to follow-up and 11 having died from other causes. None of these patients had evidence of disease on the last examination. Of the 73 determinate cases, there were 46 five-year survivals, a determinate survival rate of 63 per cent. If the indeterminate cases are regarded as failures, the absolute five-year survival rate was 49 per cent.

Of the 59 cases of carcinoma of the extrinsic larynx in the anterior group, 53 were treated from 1931 to 1954 and therefore were available for five-year study. Of these 53 cases, eight were indeterminate, four patients having been lost to follow-up and four having died from other causes. No patient in the indeterminate group showed any evidence of disease on the last examination. Of the 45 determinate cases, there were 25 five-year survivals, a determinate survival rate of 56 per cent. If the indeterminate cases are regarded as failures, the absolute five-year survival rate was 47 per cent.

Of the 40 cases of carcinoma of the extrinsic larynx in the posterolateral group, 36 were treated from 1931 to 1954 and therefore were available for five-year study. Of these 36 cases, eight were indeterminate, three patients having been lost to follow-up and five having died from other causes. No patient in the indeterminate group showed any

evidence of disease on the last examination. Of the 28 determinate cases, there were only nine survivals, a determinate survival rate of 32 per cent. Again, if the indeterminate cases are regarded as failures, the absolute five-year survival rate became 25 per cent.

Finally, of the 34 cases of extrinsic laryngeal cancer in the extensive group, 26 were treated from 1931 to 1954 and were therefore available for five-year study. Of the 26 cases, five were indeterminate, one patient having been lost to follow-up and four having died from other causes. No patient in the indeterminate group showed any evidence of disease on the last examination. Of the 21 determinate cases, there were only three five-year survivals, a determinate survival rate of 14 per cent. With the indeterminate cases regarded as failures, the absolute five-year survival rate was 11 per cent.

RADIATION DOSAGE AND REACTIONS

Radiation therapy, naturally, has its share of risks and complications. With the older yet effective method of irradiation as administered with the 200-400 Kv x-ray machines, mucous membrane reactions and radiodermatitis of moderate intensity occurred regularly but usually healed completely. The most troublesome complication among our patients has been persistent laryngeal edema, particularly of the arytenoids. At present, with the use of Cobalt-60 teletherapy, the skin manifestations are minimal, the mucous membrane reactions are slight to moderate in intensity, but postradiation edema of the arytenoids still occurs not infrequently. This edema rarely jeopardizes the patient's airway, but it may produce hoarseness.

It has been our experience that postradiation edema, when it occurs, usually disappears or is reduced to an insignificant minimum after a year or two. Corticosteroids and antibiotics are helpful in lessening the edema when there is a superimposed infection.

Persistent postradiation edema is related to the total dose, the over-all time of its administration, and the volume of tissue irradiated. It is greatly increased by infection. When deep ulceration affects the cartilage, the edema will be aggravated by chondritis. The extreme complication is sloughing of the cartilage, but this complication can be anticipated if exposed cartilage is noted or if chondritis is already present before radiation therapy is instituted. If cartilage is involved at the onset, laryngectomy is preferable to radiation therapy, except for the case in which only the tip of the epiglottis is affected.

Tumor doses in the range of 5000 to 7000 r have been administered over a period of five to eight weeks. The higher doses require the longer period of time and are applicable to the more advanced cases with the larger treatment field size. To reduce postradiation edema, it is preferable not to exceed a dose range of 5500 to 6000 r in five to six weeks and to keep the treatment field size to the minimum necessary for the known extent of the growth. This dose range is cancerocidal for almost all of the radiocurable cases of laryngeal cancer and would not complicate any surgical procedure, should one become necessary. Very large doses and heroic radiotherapeutic efforts rarely lead to a successful outcome but usually result in local conditions unfavorable for further surgical intervention.

DISCUSSION

The objectives in the treatment of carcinoma of the larynx and laryngophar-

TABLE I

CARCINOMA OF THE INTRINSIC LARYNX:
5-YEAR SURVIVAL RATES FOR PARTIAL LARYNGECTOMY

REPORT	NO. OF CASES	5-YEAR SURVIVAL	
		NO.	PER CENT
Frazell, 1960	190	171	90
McGavran, Spjut and Ogura, 1959	79	45	57*
Pietrantoni and Fior, 1958	46	37	80
Jackson, Blady, Norris, and Robbins, 1957	210	183	87
O'Keefe, 1956	371	298	80
Putney and Vicens, 1956	42	26	62*
LeJeune and Lynch, 1955	203	172	85
Schall, 1951	54	32	59**
TOTAL	1195	964	80
M.S.H. Radiation Therapy	34	30	88

*Absolute rate.
**Extensive.

ynx are (1) to save life, (2) to save the larynx, and (3) to save the voice.

In the most favorable group of cases, which are the true cord lesions suitable for cure either by partial laryngectomy or by radiation therapy, the determinate survival rates for either modality have been between 80 and 90 per cent. A number of the recent surgical reports (table I) indicates an average five-year survival rate of 80 per cent.[4,7,13,16,17,23,25,28] The results in this group are excellent for saving life, and there is no problem in saving the larynx. The choice of modality, therefore, is concerned with the factor of voice. In our opinion there is no question that radiation therapy yields by far the better voice.

In the more advanced intrinsic cancers which are treated either by laryngectomy or radiation therapy, the survival rates are over 60 per cent for either modality. A review of some of the recent results from laryngectomy (table II) shows an average five-year survival rate of 64 per cent.[7,18,23,25] The radiation successes have the great advantage of preservation of the larynx and the voice. We can expect improvement in these figures with the judicious employment of radical neck dissection as an elective procedure when indicated, either as part of the surgical procedure or after radiation therapy. We wish to emphasize at this point that a case in which radiation has failed may still be amenable to successful laryngectomy. We believe, how-

TABLE II

CARCINOMA OF THE INTRINSIC LARYNX: 5-YEAR SURVIVAL RATES FOR LARYNGECTOMY

REPORT	NO. OF CASES	5-YEAR SURVIVAL	
		NO.	PER CENT
O'Keefe, 1959	108	85	79
Pietrantoni and Fior, 1958	62	31	50
*Jackson, Blady, Norris and Robbins, 1957	201	128	64
Putney and Vicens, 1956	102	56	55**
TOTAL	473	300	64
M.S.H. Radiation Therapy	73	46	63

*Includes epiglottis and false cords.
**Absolute rate.

ever, that laryngectomy with radical neck dissection should be performed as a primary procedure when an intrinsic lesion and palpable cervical lymph nodes exist together.

In the special instance of true subglottic cancer, as distinguished from subglottic spread of a cordal lesion, the results with either surgical dissection or radiation therapy are poor. In these cases, as well as in advanced intrinsic carcinoma with palpable cervical lymph nodes, it is our plan to employ the combined technique of radiation and surgical therapy, as will be described later.

There is an intermediate group of cases in which the growth is too extensive for partial laryngectomy but can be excised by hemilaryngectomy. It is our opinion that such lesions are also suitable for radiation therapy.

In the laryngopharynx, the growths which are located anteriorly and which involve the false cords, epiglottis or upper half of the aryepiglottic folds can be treated either by surgical procedures or radiation with a survival rate of about 57 per cent. Recent reports of laryngectomy in this group of cases (table III) indicate an average five-year survival rate of 58 per cent.[3,14,20,23] In about half of these cases, simultaneous radical neck dissection was performed. This group is similar to the advanced intrinsic group in management and prognosis. Here again improved results can be expected with the addition of elective radical neck dissection and successful surgical procedures if radiation has failed.

The posterolateral group of laryngopharyngeal growths, namely cancer of the lower half of the aryepiglottic folds, arytenoids, pyriform sinuses and postcricoid area, have yielded poor results when either surgical dissection or radiation therapy has been used alone. These are the neoplasms which are frequently

TABLE III

CARCINOMA OF THE EXTRINSIC LARYNX:
5-YEAR SURVIVAL RATES FOR LARYNGECTOMY
LESIONS OF EPIGLOTTIS AND FALSE CORD

REPORT	NO. OF CASES	5-YEAR SURVIVAL	
		NO.	PER CENT
Norris, 1959	49	28	57
Pietrantoni and Fior, 1958	166	94	57
Orton, 1954	122	73	60
Clerf, 1952	34	19	56
TOTAL	371	214	58
M.S.H. Radiation Therapy	45	25	56

complicated by deep infiltration, fixation of the larynx, and involvement of regional cervical lymph nodes when seen for the first time. We were surprised to find that our absolute five-year survival rate for radiation therapy was 25 per cent.

A survey of the literature shows that a relatively small number of cases were reported in this category (table IV). The average five-year survival rate for surgical dissection was 22 per cent.[3,14,19,23]

TABLE IV

CARCINOMA OF THE EXTRINSIC LARYNX:
5-YEAR SURVIVAL RATES FOR SURGERY
LESIONS OF THE HYPOPHARYNX

REPORT	NO. OF CASES	5-YEAR SURVIVAL	
		NO.	PER CENT
Norris, 1959	30	9	30
Pietrantoni and Fior	44	7	16
Orton, 1954	66	11	17
Clerf, 1952	12	6	50
TOTAL	152	33	22
M.S.H. Radiation Therapy	49	12	24

It is in this posterolateral group of laryngopharyngeal cancers as well as extensive lesions elsewhere in the larynx that we believe that combined radiation therapy and radical surgical dissection offers a significant opportunity to improve the survival rate. This kind of combined therapy has been initiated in clinics in Italy,[21] France,[10,11,27] and England,[8] and lately in this country at the M.D. Anderson Hospital and Tumor Institute of the University of Texas.[12] There are three different plans in which this combination is used: (1) surgical dissection followed by radiation, (2) radiation given before and after surgical dissection, which accordingly has been called the sandwich method, and (3) radiation followed by surgical dissection—the method which we propose and have used in our program.

The principles of preoperative irradiation are (1) to prepare the involved tissues for a radical operation by the destruction of the actively dividing cancer cells, both in the tumor and beyond the tumor, and by the mitotic-inhibitory effect on the cancer cells which are not destroyed, and (2) to create the best physiologic state which will permit the execution of the operation and the healing of the tissues without undesirable or serious difficulties. This method, on occasions, may cause slight increased vascularity of the areolar tissue at operation, delayed healing of wound edges, or possibly additional pharyngeal fistulas, but these problems should not dismay the capable surgeon in his attempt to improve the survival rate of patients with these prognostically poor lesions. It should be realized, however, that these problems may also arise without preoperative radiation.

It should be pointed out that the recurrent or persistent tumor arises from those cancer cells which were not destroyed by the radiation, but instead were transformed into a phase of mitotic inhibition. The new generations of cancer cells are not influenced by the previous radiation therapy and possess the activity and growth potential of the original neoplasm, with its capacity for infiltration and spread. If radical dissection is performed at this stage, the same poor prognosis holds as for the primary surgical treatment of this disease. Therefore, from an oncological viewpoint, the best time for surgical intervention is in the early postradiation period before there is evidence of new growth of the neoplasm.

The argument has been advanced that some normal larynges will be removed unnecessarily if surgery is performed in the early postradiation period when the anatomical structures appear normal and there is no clinical evidence of recurrence. However, if one were to wait for the appearance of the recurrent tumor, which seems to be inevitable in nearly 80 per cent of the cases under consideration, the favorable surgical advantage of operation during the amitotic phase of the growth would be permanently lost and the patient again would be doomed to the poor prognosis that had existed previously for the disease. We have removed after radiation therapy four larynges which were found to be free from disease. However, there were positive metastatic neck nodes in two cases, and a nest of cancer cells in the neck of the third patient. In the fourth case no cancer was revealed either in the larynx or in the radical neck dissection specimen.

With a tumor dose of 5000 to 5500 r administered in five weeks, the radiation reactions subside in about three weeks. After the completion of therapy, the skin is smooth and hairless, the subcutaneous tissues are pliable and elastic, and the mucous membranes have an almost normal appearance. From the tech-

nical point of view, the optimum time for surgical intervention exists between the third and the sixth week after irradiation.

The combined method of treatment which we propose consists of three phases which must be carried through as a single plan. The first phase is the period of radiation therapy for five weeks; the second, the postradiation period of three to six weeks for the subsiding of the radiation reactions; and the third is the radical surgical dissection.

We have treated nine cases by this combined method during the past three years; therefore, this presentation must be considered as a preliminary report. All the patients are alive, except two who died from other causes, and manifest no evidence of disease. All had received a tumor dose of radiation of approximately 5500 r in five to eight weeks. Radical surgery followed three to six weeks later except in one case, in which it was delayed because of a poor cardiac condition.

Although our experience with this form of combined therapy is limited thus far, we have been impressed by its efficacy. We have encountered no serious interference with surgical technique or tissue healing. We have observed instances in which the tumor seemed to have disappeared, in which neoplasms which originally appeared formidable and possibly inoperable became amenable to surgical procedures, and in which cervical lymph nodes, originally large and fixed, became smaller and more easily resectable. At times radiation therapy permitted a more thorough surgical extirpation.

It is hoped that this preliminary report will arouse the interest of other laryngologists in this combined method of therapy for laryngopharyngeal and laryngeal lesions which by present forms of therapy offer a poor prognosis. If the value of this combined method is to be determined in a reasonable period of time, the coordinated efforts of a number of clinics will be needed.

SUMMARY

Laryngeal cancer has been treated successfully by two methods, surgical dissection and radiation therapy. The survival of patients is determined more by the original locations of the neoplasm than by the modality of treatment. Thus, a classification dependent on the practical aspects of prognosis has been presented as a basis for the extent and evaluation of therapy.

Clinical evidence has been offered to show that radiation therapy alone should be regarded as an effective method in the treatment of laryngeal cancer. This is especially true in uncomplicated intrinsic lesions suitable for partial laryngectomy or for laryngectomy.

Treatment of laryngopharyngeal growths which involve the lower half of the aryepiglottic folds, arytenoids, pyriform sinuses and postcricoid area yields poor results not only by radiation therapy but also by surgical dissection; thus, they present a challenge both to laryngeal surgeons and to radiotherapists. It is for this group of laryngopharyngeal cancer, as well as for instances of extensive involvement elsewhere in the larynx, that we have proposed a program of combined radiation therapy and radical surgical dissection, in that order, with the expectation that the survival rate of patients with these desperate lesions may be improved.

Although our experience with this form of combined therapy is limited thus far, we have been impressed with its efficacy and are making this preliminary report to enlist the interest of lar-

yngologists in this country in this method of therapy.

DISCUSSION

JEROME A. HILGER, M.D., St. Paul, Minnesota: Our methods of treating cancer are determined by prior experience. This trial-and-error approach for the individual therapist, be he surgeon or radiotherapist, is an evolutionary process based on his training period and modified by his subsequent experiences. It is self-evident in the selection of a five-year base for judging cancer control that the development of an adequate personal judgment takes a major share of the individual's professional lifetime. This period can only be shortened if he can rely heavily on the experience of his predecessors. This implies a common language. In the field of laryngeal and hypopharyngeal cancer, we have had none. Despite the great variation in the biological behavior of cancers of the larynx and hypopharynx, we have not had a descriptive terminology that would allow valid comparison between series.

This want has been met by a committee with international representation which convened one year ago in Paris in preparation for the VII International Congress of Otolaryngology. Dr. C. L. Jackson represented the United States. Through the courtesy of Dr. Paul Holinger, I have a copy of the Classification evolved by the committee and am inserting it for publication with this discussion as a contributory effort to its early and widespread acceptance. Some may not find it perfect, but the value of its universal acceptance as a common language will far outweigh any small differences of opinion.

Dr. Goldman's thesis relates particularly to the treatment of lesions of the three regions of the hypopharynx: the region of the pyriform sinus, the retrocricoarytenoid region, and the posterolateral wall—and the marginal region of the larynx in its posterior area. Cancer in these areas is a sad disease. It metastasizes early and frequently. It gives little warning through early symptoms. Late diagnosis is the rule. Control rates are low. We can have little pride in the over-all results.

It is because there is so much room for improvement that Dr. Goldman makes the bold and reasonable proposal that radiation versus surgical dissection be supplanted by radiation plus surgical dissection.

The proponents for surgical dissection as the primary method of therapy cannot derive comfort from their results. When the biological balance between host and focal cancer once tips in the direction of systemic disease, a grave turn has occurred. One can only assume the widespread contamination of the local tissues. This is difficult to combat with a scalpel. In our view, the surgeon serves best in sweeping the area of postradiation persistence. That the latter occurs is apparent from the unhappy results of radiation therapy alone.

Dr. Goldman's figures suggest that approximately 20 per cent of postradiated surgical specimens will show no persistent carcinoma. Yet, the optimum time for surgical intervention is lost if these cured cases are not sacrificed. In our experience, this 20 per cent is likely to come in a particular group of lesions. I would suggest that his projected program be modified to exclude this particular group from the blanket policy of postradiation excision. I believe he does not intend their inclusion.

I revert to the classification and staging system of the international committee to define these exclusions. The regions of discussion are the three regions of the hypopharynx: the region of the pyriform sinus, the retrocricoarytenoid region, and the posterolateral wall—and the marginal region of the larynx (the free border of the epiglottis, the aryepiglottic folds, and the arytenoids). Dr. Goldman includes only the posterior portion of the latter region in his projection, but I would ask his indulgence in conforming to the new system so that we may maintain our new found common language.

The exclusions:

"*Stage I* lesions limited to one of these regions without impairment of motility and without palpable lymph nodes (T_1 N_0);

"*Stage II* lesions limited to one region without impairment of motility but with homolateral movable lymph nodes (T_1 N_1); and

"*Stage III* lesions limited to one region without impairment of motility but with bilateral or contralateral movable lymph nodes (T_1 N_2)."

These primary lesions I would hold to represent the majority of the 20 per cent likely to be controlled by radiation. For these I would reserve the right to individualize relative to postradiation block resection, neck dissection, or observation.

The more advanced stages of the disease can well be included in Dr. Goldman's projected program if the following principles are met:

"1. The staging be accomplished by a skillful laryngologist in accord with the system of the international committee;

"2. The radiation therapy program be conducted by a therapist of exceeding competence with all the concurrent help the laryngologist can give;

"3. The post-radiation surgery be of the highest caliber;

"4. The surgical pathology be elaborately analyzed;

"5. The program be carried forward in a limited but representative number of centers with a single organizational responsibility in each."

On this basis I would say Dr. Goldman's projection would receive the critical analysis it deserves.

I offer him the full cooperation of one center. I hope others will come forward and do the same.

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CERVICOFACIAL CONGENITAL ANOMALIES

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THE purpose in presenting this intriguing subject is to correlate the developmental anatomy and the clinical management of anomalies of the head and neck. It is my hope that the paper will prove of practical value to the surgeon, and that some of the principles outlined will add to his own armamentarium. The selected bibliography should serve as a springboard for the physician or student who desires to pursue in more detail any one aspect of this fascinating subject.

An understanding of the embryology is essential for a thorough knowledge of cervicofacial surgical anatomy. The otolaryngologist, because of his familiarity with the anatomic intricacies and other medical and surgical diseases of this area, is most qualified for recognizing these anomalies and directing their management. If he is informed regarding present-day treatment, he will be better able to advise his patients or his patients' parents. I submit, with humility, some original techniques and philosophies along with some from those of greater experience with the hope that this survey will be of practical value to the reader.

Presented at the Sixty-Fifth Annual Session of the American Academy of Ophthalmology and Otolaryngology, Oct. 9-14, 1960, Chicago.

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I would like to express my appreciation and thanks to Dr. Robert G. Iglesias, otolaryngologist, Tampa, Florida, for his services as medical illustrator.

CLINICAL MANAGEMENT

In managing cervicofacial congenital anomalies, the aspect which requires the greatest study and correlation is the proper timing of surgical intervention in relation to growth and functional development, in order to cause minimal tissue disturbance and minimal interference with growth centers. A critical analysis of each deformity must be made and the surgeon should be flexible in both the timing of the operative procedure and the exact technique to be used. Clinical management starts in the delivery room. Critical attention must be given to the airway passages; and one must be alert for the complications associated with posterior choanal atresia or micrognathia with retraction of the tongue and obstruction. When nasal obstruction from any cause exists, even with the normally recessed chin of the newborn, occlusion of the airway can occur from retraction of the tongue before the infant has adapted to mouth breathing. This condition may occur after closure of a wide cleft lip and may require some modification of the Douglas procedure for suturing the tongue out and forward.

CONGENITAL CHOANAL ATRESIA

This condition, which results from persistence of the bucconasal membrane, is discussed first, as it can produce an emergency in the newborn with the threat of asphyxia when it is bilateral. The atresia in general may be membranous or bony, complete or incom-

plete, unilateral or bilateral. With bilateral complete obstruction, surgical intervention may be necessary early, yet conservative measures may be followed; some infants quickly adapt to the total obstruction, developing mouth breathing habits with little difficulty. Usually, with close observation, an adequate oral airway and good nursing care, time can prepare the infant properly for the surgery even in the more extreme cases.

Some surgeons prefer a temporary blind perforation of the atretic wall, waiting until the child is older for a more definitive surgical approach. With controlled bleeding and improved anesthesia, the most desirable plan of attack is upon tissues undisturbed by previous blind perforations or tubes.

Some modification of the transpalatine approach allows the best exposure for more complete removal of bony atresia and preservation of mucous membrane flaps to cover raw surfaces. The approach of choice should be made according to the existing disease. A larger flap extending forward over the hard palate and preserving the supply of the major palatine vessels seems logical for the thick bony atresia, in which bone must be removed further anteriorly. Individualization, as always, is essential and it would seem that the approach utilizing a smaller flap over the posterior portion of the hard palate, which extends laterally posterior to the palatine foramen, is the operation of choice for the more usual thin posteriorly placed bony plate. In either case, the raw surface is most desirably covered with the preserved available mucous membrane as flaps. In recurrent cases, where considerable scar tissue exists, skin grafts may be necessary, but these are not usually advocated as a primary procedure. I would like to suggest the use of a small cuffed endotracheal tube when it becomes necessary to maintain pressure on either mucous membrane flaps or skin graft so that the cuff may be utilized for this pressure and hemostasis, yet the airway maintained.

The timing for correction of bilateral complete atresia depends upon the reaction of the child and may be performed in the newborn. In unilateral atresia, the correction has more often been done in young adult life, when it can most often be repaired through an intranasal approach. With improved techniques I see no reason for subjecting the child to the social and physical discomforts of chronic nasal discharge and irritated nares beyond the late preschool years. By the age of five or six the major growth of the palate and adjacent structure has occurred, and careful surgical correction is not apt to interfere significantly with growth.

The transpalatine approach is well tolerated by infants and young children and offers better exposure for removal of the atretic bone, the necessary portion of the palate and vomer, and more direct manipulation of the mucosal flap.

FACIAL DEVELOPMENT

This paper does not call for a detailed review of the embryologic development of the face, but the student is encouraged to make such a study for a better understanding of the clinical management and surgical techniques. Figure 1 (top) shows the relation of the maxillary process, globular process and nose in a six-week embryo. In figure 1 (center) the appearance of the newborn infant almost duplicates that of the six-week-old embryo. Figure 1 (bottom) shows the result of a two-stage repair of this severe deformity. In this infant, there were associated deformities of microphthalmia, protruding ears and general underdevelopment of the cranial structures. The cleft palate deformity

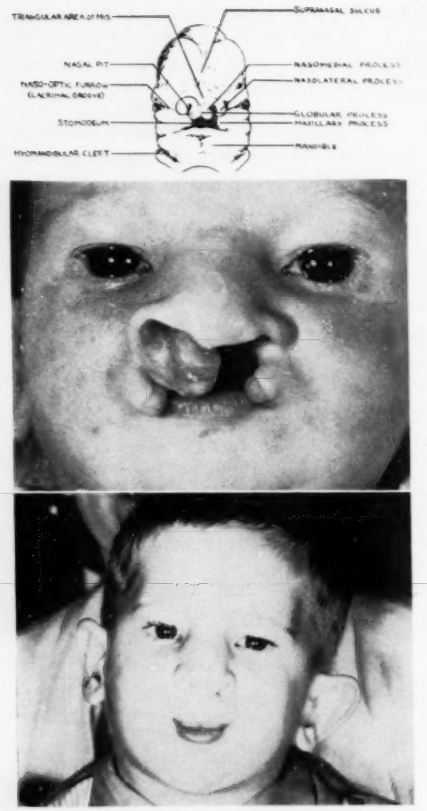

FIG. 1—(Top) This drawing of the six-week embryo shows the areas from which the possible anomalies of arrested facial development originate. The relation of the nasal, globular, and maxillary processes is emphasized. Lateral clefts may arise in the nasooptic furrow or between the maxillary and mandibular processes of the first branchial arch.

(Center) The structural appearance of this extremely wide, bilateral, complete cleft lip may be readily correlated anatomically with the embryo. In this infant a severe cleft palate, microphthalmia, ear deformities, and possible faulty cranial development were associated with the deformity. The premaxilla is markedly protruding and rotated and there is virtually no columella.

(Bottom) The repair in this case was carefully staged following the principles outlined in the text. In view of the severity of the original deformity, the result must be evaluated in terms of improvement rather than as ideal. The most severe cleft was repaired first and the second stage performed two months later, completing the bilateral closure. Note the increased height of the columella with the passage of time without definitive surgery being performed in this structure. Some columella lengthening procedure may be done but will not be considered until ample time for maximum development has been allowed.

was quite severe and bilateral. Notice the areas of the nasal bridge, the lateral facial cleft, and the position of the ears in the embryonic stage of development (fig. 1, top).

HARELIP AND CLEFT PALATE

Our present knowledge of embryology is quite advanced and there are a variety of surgical techniques for correction of harelip and cleft palate deformities. However, the area which requires further study is facial growth after birth and its correlation with clinical management, the timing of repair, and what occurs when repair is delayed. Detailed study of cephalometrics and myodynamics has been done, and it behooves each of us to keep pace with these findings.

In general it seems fundamental that the re-establishment of normal muscle forces for the molding of facial structures should be done as early as possible so long as there is minimal disturbance of growth centers. The assets and liabilities of each of these factors must be carefully weighed. Does re-establishment of normal myodynamics warrant the scarring or disturbance in growth which the individual deformity requires at the particular time? Certainly the day of heroic attempts to close the cleft of the lip or palate at all costs has passed. A more conservative and appropriate staging of repair will yield better functional and cosmetic results, but it does require patience on the part of the parents and the physician. It has been proved that with time the cleft becomes more narrow, especially after re-establishing some muscle forces. However, the need for closing the cleft and the development of more proper tongue placement has also proved to be a factor in preventing the very narrow dental arch seen in the delayed cleft repair.

THE UNILATERAL CLEFT LIP

The time for surgical repair of the unilateral cleft lip ranges from the first few hours of life to three months in age. Each surgeon has his reasons for selecting a certain age or certain specific criteria. It is often desirable and practical to complete the repair before the child leaves the hospital, say at five to seven days. In a healthy child with normal hemoglobin and good weight, this is certainly often done with good results and no ill effects. It would seem practi-

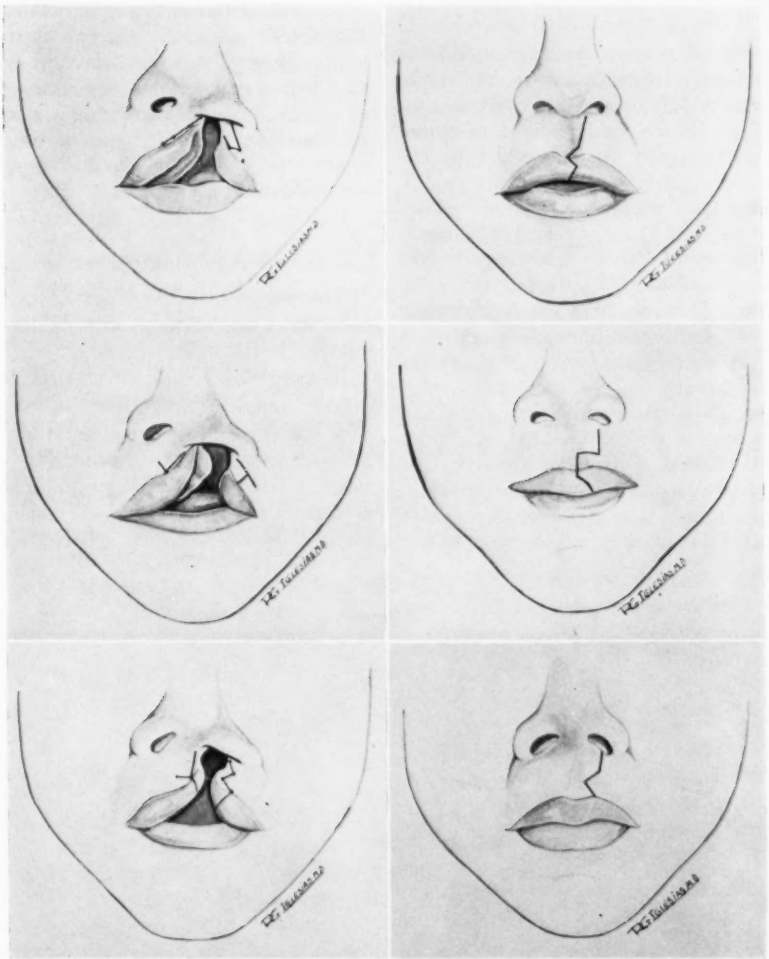

FIG. 2 — A comparison of the recommended types of repair of the unilateral cleft lip: (Top) the triangular flap repair (Brown); (Center) the quadrilateral flap repair (LeMesurier); (Bottom) the "Z" incision and triangular flap (Tennison).

cal to wait until the infant has regained the birth weight, if over seven pounds, but to operate before the neonatal hemoglobin falls. Strict criteria, such as a body weight of ten to fourteen pounds or a definite number of weeks of age, are not necessary. Certainly the hemoglobin should not be less than 10.5 grams. I would advocate a pediatric consultant in all surgical cases involving infants.

In summarizing our review of the numerous techniques for repair of the unilateral cleft lip, the repairs generally used today are modifications of either the triangular or quadrilateral flap. The basic flaps from which the many modifications have been published are shown in figure 2. These various techniques should be modified according to the severity and needs of the particular deformity. In my experience, modification of the LeMesurier quadrilateral flap (fig. 2, center) has given good results. By removing no tissue on the medial aspect of the cleft and shifting the Cupid's bow to the midline, the objections of the laterally displaced Cupid's bow can be overcome. The Tennison technique (fig. 2, bottom) circumvents this problem by placing the incision lateral to the Cupid's bow, preserving the vermilion line on the prolabium side of the cleft. With individualization and modifications, the objectionable, laterally displaced Cupid's bow and the lip which is too long can be overcome with some increased angulation. This angulation, however, is not the simple triangular flap (fig. 2, top) which we now more often reserve for the bilateral cleft lip. With the Tennison triangular flap, a Z incision is effected. The preoperative and postoperative appearance of an infant with a unilateral harelip repaired by a modified quadrilateral flap technique is shown in figure 3. Note the slightly overcorrected angulation and superior attachment of the ala.

BILATERAL CLEFT LIP

The same principles of timing are applied in the management of the bilateral cleft lip. However, more often than not, this repair is staged. With severe complete clefts, the advisability of a staged repair, in my opinion, cannot be overemphasized. It is astounding how much the markedly protruding premaxilla associated with complete bilateral clefts will recede when muscle forces

FIG. 3 — Repair of unilateral harelip made with a modified quadrilateral flap technique. Attention is directed to the nose, where there is slight overcorrection in the height and angulation of the alar attachment.

are re-established even on one side. Staging greatly simplifies the repair on each side, eliminates the need for any set-back procedure, and preserves a maximum amount of normal tissue with the least possible tension. Following the principles outlined, I am generally opposed to any set-back procedure for the premaxilla. It has been repeatedly shown that with the muscle forces in action, the protruding premaxilla and associated nasal structures will reposition themselves. The destruction of normal tissue, especially in the area posterior to the premaxilla, which is so directly related to the normal growth of the nose and future septal position, seems illogical and contrary to our teachings in plastic repair and rhinology.

The first stage of the bilateral lip repair is timed as for the unilateral lip. The second side is repaired approximately two months or, in severe deformities, as long as three months later. If the premaxilla is rotated or deviated to one side, as a rule the side which would exert the greatest force in realigning the entire prolabium-premaxilla complex is repaired first (fig. 1). The exact staging must be planned according to the severity of the deformity and, more particularly, to the response of the tissue to the initial repair. The surgeon must be patient and wait until the conditions are optimum; and he must promote the proper understanding of the parent.

My technique for repair of a bilateral cleft lip has been either a modification of Brown's technique, as outlined for the unilateral cleft, or a modification of the Federspiel method. The former technique is more generally used, as it is felt that it preserves the maximum amount of normal tissue and can be adapted to a particular deformity. By modification, the vermilion margin and a portion of the mucous membrane are preserved on either side of the midline to effect a natural Cupid's bow without an incision line at the junction of the vermilion with the skin of the prolabium. Mucosa and skin flaps are reflected inward to produce additional raw surface for attachment of the lateral lip. The superior margin of the lateral side of the cleft is based upward and rotated as a flap for the reconstruction of the floor of the nose. Considerable attention is given to the nose, especially as regards the alar attachment level and angulation, in an attempt to avoid later harelip nose deformities.

CLEFT PALATE

A review of the relationship of the palatine process of the maxilla, the nasal septum, and the globular process should be made in order to understand the varieties of cleft palate which exist. The cleft may extend through all types, from a simple bifid uvula to complete bilateral cleft extending through the alveolus on either side of the premaxilla.

The simple incomplete cleft, not involving the hard palate, may be repaired in twelve to eighteen months, but attention should be given to the length of the palate. If palatal lengthening is required, it is perhaps best to postpone the procedure for eighteen to twenty-four months, and then perform some palatal lengthening procedure. Generally, the repair is made within eighteen to twenty-four months, but again both factors must be critically correlated with the severity of the deformity and the tissue disturbance required for the particular repair. Some authors advise waiting until the child is four or five years old before completing closure of the palate. With such a delay, the defect undoubted-

ly becomes more narrow and repair is consequently easier. The problems of speech and tongue placement, however, may become multiplied. These patients generally have developed faulty speech patterns, and more intensive speech therapy is required than in those in whom the defect was repaired at an earlier age. There is a good argument for repair before early speech habits become fixed. Certainly in the wide cleft, where a velar closure is possible but complete closure is too heroic, this operation has much to offer. In such cases a happy medium can be reached, and it seems reasonable to perform the velar closure at two years, allow one year for further growth with the advantage of re-established muscle pull, and complete the repair at age three, before major speech development has occurred. In this way, the advantages of a staged procedure are utilized, yet speech therapy may be minimized. Again, each case must be individualized.

In the limited incomplete cleft, critical evaluation should be given to muscle development and midline tissue anterior to the cleft. Quite often both muscle and fibrous tissue are deficient and the cleft must be completed before repair is undertaken.

In the incomplete cleft we have used (1) direct closure; (2) direct closure with relaxing lateral incision; or (3) modification of the Dorrance and Brown push-back operations when lengthening of the palate is necessary.

When there is sufficient mucosa in the anterior aspect of the hard palate, or if this has been closed in a complete cleft by vomer flap, the combined relaxing incision and push-back operation described by Wardill is used. For the more complete cleft, mucoperiosteal flaps with modifications of Longenbeck's repair are used. At no time are plates or wire stay sutures utilized.

The use of the vomer flap does not seem to me entirely physiologic or in line with placing tissues in their normal relationship, and I prefer to avoid this technique where possible. When necessary, in the severe bilateral complete clefts, a vomer flap is utilized when the patient is 18 to 24 months old, and the second stage of the posterior cleft is done three to six months later.

Following these principles, the incidence of secondary maxillary deformity has been minimal and normal speech patterns have been re-established at the earliest possible date. We should, however, certainly not be opposed to the use of prosthetics and, when the deformity is too severe, the dental obturator is most useful and the treatment of choice (fig. 4). Occasionally when the obturator has been used initially, after the passage of time an inoperable palate may become operable.

THE HARELIP NOSE

The close relationship of the palatine process of the maxilla, the nasal septum and the external nose is clearly demonstrated in sections of the six-week embryo. The associated abnormal septal development and the deformities which result, such as high narrow palate and cleft palate, have been described. In the harelip deformities, the nose may produce greater technical problems and postoperative distortion than the lip itself. Careful attention is directed toward the nose at the time of the initial repair, to ensure proper alar attachment height and angulation. Some advise against any undermining, particularly over the nasal tip, emphasizing that the resultant scarring makes later nasal repair more diffi-

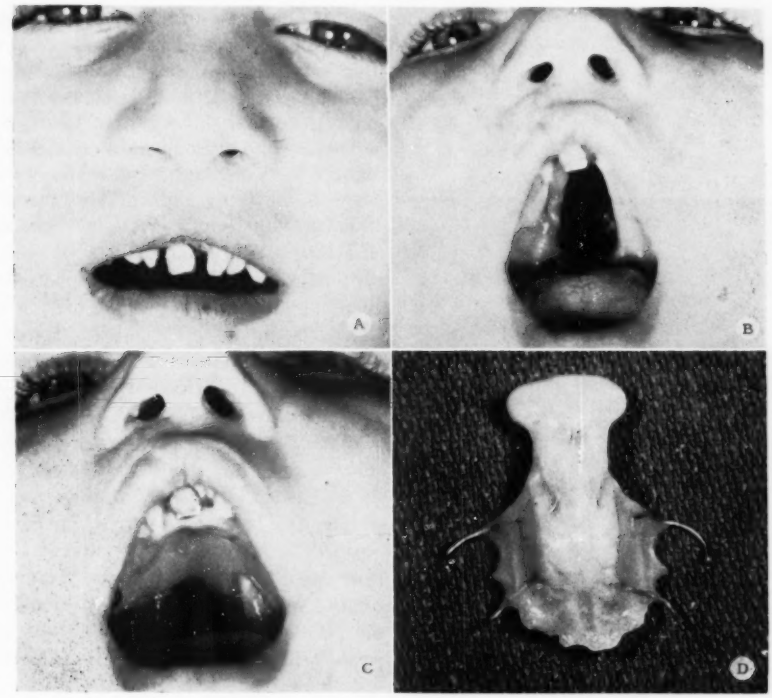

FIG. 4 — (A) Four-year postoperative result after repair by a triangular flap technique for a unilateral cleft lip. Note the nasal contour. (B) Attention is directed to the alar attachment and nasal tip. This severe cleft with minimal lateral tissue and a short palate was not repaired and a prosthetic obturator was advised. (C) Dental obturator in place. Speech development has been good. (D) The prosthesis.

cult. This scarring, in my experience, is hardly perceivable when secondary repairs are postponed until after puberty.

With critical analysis of the original unilateral harelip nose and the wide lateral attachment of the ala to the maxilla, it is apparent that the ala must be freed to some extent. In order to allow readjustment and rolling of the lower lateral cartilages in relation to the overlying skin after reattachment of the ala, some undermining over the cartilage itself seems logical. I have followed the general plan of freeing the ala from its attachment to the bony maxilla and undermining through this lateral incision over the lower lateral cartilage to a limited extent. Some overcorrection is done, effecting slightly greater angulation and attaching the ala slightly higher than on the normal side (fig. 3). The tendency is for widening of the nostril and a lowering of the alar attachment. This method is followed in an effort to overcome the secondary nasal deformities. I maintain that the nose is a greater initial challenge than the lip, and certainly the nose may produce a more grotesque deformity and in later years become more technically difficult to repair.

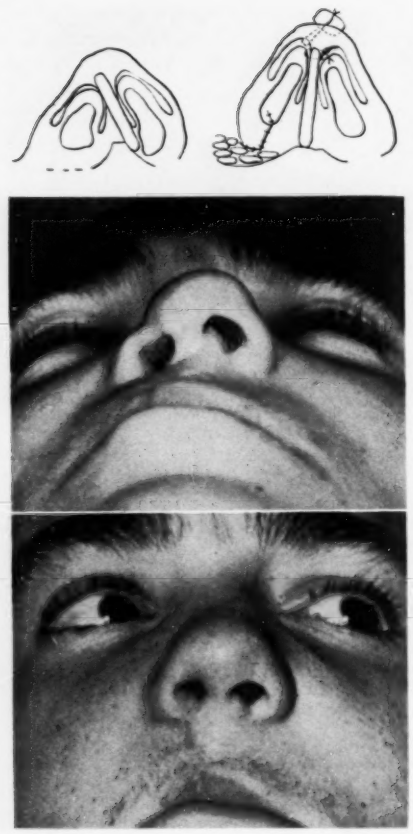

FIG. 5 — (Top, left) The abnormal anatomy of the lower lateral cartilage, alar attachment, maxilla and nasal septum in the harelip nose. (Top, right) The author's technique for surgical repair of the harelip nose, including complete freeing of the lower lateral cartilage and an onlay graft of the maxilla combined with septal reconstruction. (Center) Typical harelip nose deformity. (Bottom) The postoperative result, using the technique outlined as a composite operation.

The secondary unilateral harelip deformity of the nose has certain characteristics which are almost always present (fig. 5). Certain components of the deformity may be worse than others in some patients. The maxilla on the involved side is underdeveloped, producing flattening beneath the alar attachment and depression of the floor of the nostril. There is posterior or dorsal displacement of the entire alar cartilage so that the tip is lower to this side and the medial crura contribute to columella tilting. Because of this tilting of the tip and columella one must make a critical evaluation to determine whether the entire nose is deviated or whether there is only an apparent deviation. The alar attachment is low and laterally displaced so that the nasolabial angle is flattened, blending abnormally with the cheek. There is almost invariably a deviation of the cartilagenous and bony septum with caudal displacement or dislocation into the uninvolved side. Attention must be directed toward providing more physiologic and more comfortable breathing as well as toward correcting the cosmetic deformity. In some cases, I have performed a composite operation on the nose with gratifying results. The secondary procedures are usually done after puberty. Not all phases of this described procedure are necessary in the individual case.

In brief, this procedure requires some form of septal reconstruction with emphasis upon preserving a maximum amount of cartilage and support. Particular attention is given to the area of the premaxilla, and it is often necessary to remove the anterior spine to produce adequate footing for the columellar strut. By this technique, an alar marginal incision is made in combination with the usual intercartilagenous incision used in rhinoplastic surgery. The entire lower lateral cartilage is presented, freed of both the vestibular and dorsal skin, and then rolled upon itself into the dome of the nose, where it is sutured to the opposite medial crus and nasal septum. A through-and-through suture tied over a bolster is utilized to produce a slight overcorrection of the newly formed dome on the involved side. The entire

alar attachment is freed and, in combination with the removal of the necessary amount of scar tissue from the floor of the nose, reattached at the proper level with the desired angulation. Prior to closure, the maxilla on this side is built up through this incision with cancellous bone from the iliac crest, preserved homogenous cartilage, or autogenous cartilage and bone removed from the nose, if a hump has been removed. In individual cases, it is desirable to review the lip scar in its relation to the incision into the floor of the nostril. It is more advisable, however, to separate the two procedures. The technique of this operation is being published in detail in another article.

THE SECONDARY HARELIP DEFORMITY

The principles which guide the repair of the harelip necessarily apply to secondary reconstruction. In the majority of cases, complete excision of the scar and reproduction of the complete cleft are required in order to carry out the satisfactory repair and re-establishment of proper tissue approximation. The straight contraction line must be broken, the tissues placed in accurate approximation, and the vermilion margin reconstructed. Older forms of primary repair did not emphasize the preservation of tissue and production of a near normal Cupid's bow, as we now do. To accomplish this goal as a secondary procedure, it is sometimes necessary to excise a strip of skin paralleling the vermilion border, patterning a Cupid's bow along the superior border before advancing mucous membrane from the undersurface of the lip. This technique can be utilized to give a more pleasing fullness and pucker to the lip. Although scar tissue must be removed, often there are advantages present, such as reduced tension, which sometimes allow a secondary procedure to be more exacting than the primary. With the extremely tight lip and deficient tissue, it is sometimes necessary to utilize more extensive procedures, such as rotation flaps from the lower lip.

MANDIBLE AND EAR DEFORMITIES

The cleft lip and palate problems arise chiefly from abnormal development in the middle third of the face, especially of the maxillary process of the first branchial arch. Deformities of the mandibular process are less frequent, and they are intimately related to deformities of the ear. Clefts of the lower lip and mandible are rare and will only be mentioned here.

Associated with macrostomia and lateral facial clefts between the maxillary and mandibular processes are vestigial preauricular cartilages, microtia, stenosis of the ear canal, an abnormal ossicular chain, and the ear placed low in the neck from failure to migrate superiorly with development (fig. 6). Micrognathia and microphthalmia are often seen in this complex, as is the entire discouraging Treacher-Collins syndrome.

The relation of Meckel's cartilage to the formation of the bone of the mandible and ossicles of the ear accounts in part for the related anomalies. You will recall that Meckel's cartilage contributes to the formation of the malleus and incus, whereas Reichert's cartilage from the second branchial arch forms the stapes and styloid process. Combined anomalies of the mandible and malleus and incus are not uncommon, but absence of the stapes and styloid process or anomalies of these structures are unusual. Clefts may extend from the stoma to the pinna and require major reconstruction, including the underlying soft tissues (fig. 6). The incomplete clefts

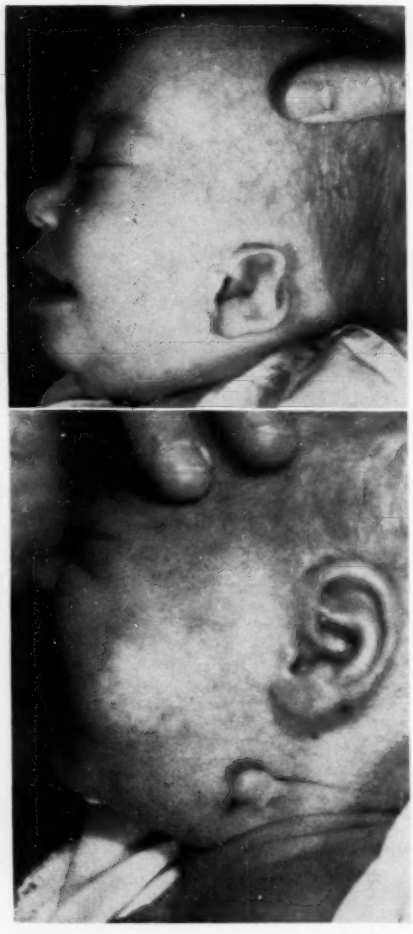

FIG. 6 — (Top) Macrostomia with failure of fusion of the mesodermal elements of the maxillary and mandibular processes at the lateral commissure. Associated ear deformity and preauricular appendages. Note the failure of the auricle to migrate superiorly and compare with the embryo drawing in figure 1. (Bottom) Lateral cervical fistula with an associated cartilaginous and epidermal appendage, remnants of the hyoid arch development and Reichert's cartilage. In this case the condition was bilateral.

associated with simple macrostomia are readily closed, but the reconstruction of a lateral commissure which is normal both in appearance and function requires a precise plan of repair.

The external ear is derived from approximately six colliculi formed between the mandibular process of the first arch and the second arch. Cysts and sinuses may develop in the intertubercular grooves and are of this origin rather than from the first branchial groove. The most common site for fistulas is anterior to the helix in the preauricular area. The fistula must be dissected to its termination. Cysts of the parotid area are probably derived from the first groove and pouch. Ingrowth of the first branchial groove and the associated existence of the lamina epithelialis may be incomplete, producing complete congenital stenosis of the external auditory canal.

Deformities of the auricle due to incomplete development may be repaired with reasonable success if there is sufficient framework with which to work. Total reconstruction of the ear is discouraging and disappointing. In this regard, I have a strong desire to perfect and try some of the techniques which have been original in my own thinking. However, in all honesty to myself and my patients, I feel I must present the unbiased facts regarding the necessary staging, the possibilities of complications somewhere along the line, and the final appearance. With this approach one finds very few patients who are willing to undergo a total reconstruction. This is an area in which the plastic techniques that we have to offer are not adequate so far as the end result is concerned. One must carefully weight the advantages of an imperfect ear constructed from the patient's own tissue against a prosthesis with its shortcomings; then the patient should determine the course. Limitations of color match and permanency of color and consistency of the plastic prosthesis, I believe, will be overcome in the immediate future with modern plastics and technology. If one elects to use a prosthetic device, however, certain reconstructive procedures are often indi-

cated. The cutaneous cartilage remnants may be altered or a canal constructed to offer better footing or a more natural appearance for the prosthesis.

Surgery of the canal most often should be combined with repair of the drum and middle ear. In general, canaloplasty should not be undertaken unless the surgeon is both qualified and prepared to manage the middle ear. Development of the ossicles and the otocyst in its cartilagenous capsule must be known and any of the numerous developmental anomalies in this area allowed for. The full variety of tympanoplasty and stapediopexy may be necessary. Utilization of the pathologically indicated stapes mobilization operations or fenestration surgery is not for discussion here, and I will leave this subject to those more qualified, but certainly, the "compleat otologist" must be schooled in the developmental anatomy of the inner ear structures.

The argument for not operating on an ear in cases of unilateral conductive deafness in the presence of normal hearing in the opposite ear, I believe, is sound thinking. However, to be able to offer the patient some binaural hearing along with the production of a canal and reconstruction of the external ear has merit and is certainly something to consider in the individual case.

Most reconstructive procedures on the external ear are postponed until the child is 4 or 5 years old, and certainly surgery of the delicate middle ear should be postponed at least until this age. Included with the surgery of the external ear should be the lesser procedures, such as otoplasty for the correction of protruding ears due to faulty development of the antihelix. In the correction of protruding ears, the procedure is simple and offers a great deal of gratification for the patient and the parents. We have often emphasized the need not only for correcting the protrusion but also for producing normal contour in the ear as seen from the side.

MICROGNATHIA AND MACROGNATHIA

With underdevelopment of the mandible and chin, there is often an associated malocclusion of the teeth and an open bite. It is interesting to correlate this anomaly with the nose-palate complex and observe that with near normal development, the receding chin and high narrow palate are seen in combination with nasal-dorsal hump deformities and septal deflection such as the maxillofacial triad.

The repair of chin deformities usually is delayed until after puberty. With the simple receding chin, where occlusion is satisfactory, it is possible to do some type of onlay chin implant, preferably using autogenous cancellous bone. A satisfactory number of good results are obtained with homogenous preserved cartilage implants in this area. The simplification and availability of this material makes it sometimes more practical to use, so long as the possibilities of resorption or extrusion are explained to the patient. More satisfactory correction of the micrognathic jaw is obtained with some type of sliding osteotomy, preserving the mental nerve and correcting the open bite with careful occlusion. In the macrognathic jaw, one or two stage osteotomy and removal of a section of mandible are necessary. One or more teeth often must be removed to allow for accurate alignment of the remaining teeth. We have preferred to use the Dingman procedure in one stage. Where teeth are not present for intradental wiring, it is necessary to use some type of acrylic mold splint with circumferential wiring of the mandible.

MIDLINE AND LATERAL FACIAL CLEFTS

Before leaving the subject of facial anomalies, further mention of the median cleft should be made. The midline cleft of the lip produces a severe deformity and is quite often associated with the bifid nose. With this condition also one sees the midline cyst of the nose, which may arise either from epidermal inclusions or as a meningocele. This deformity is often accompanied by severe ocular hypertelorism. There are no satisfactory procedures for actually narrowing the intracanthal distance in these severe craniofacial deformities. However marked improvement can be made by correcting the midline cleft of the nose, or by removing the midline cyst. The surgeon must be prepared to split the nasal bones and follow the cysts to their termination. If one is not prepared for this attack by training, he should not attempt these problems. Various camouflaging procedures can be carried out when the patient is older. Particularly useful are osteotomies for narrowing the nasal bridge and the insertion of dorsal nasal implants, raising the nasion and offsetting the flat, wide, intracanthal distance.

Other median cysts may occur in the mandible, maxilla or palate. Also related are the nasoalveolar and globulomaxillary cysts which arise from trapped epithelial rest.

The lateral facial cleft associated with macrostomia, preauricular appendages and ear deformities has been discussed above. A rare but extremely challenging deformity is the lateral facial cleft associated with the formation of the nasolacrimal duct. This deformity, due to improper fusion of the lateral nasal process with the maxilla in the naso-optic furrow, sometimes extends from the inner canthus of the eye, around the lateral nasal process and into the mouth.

BRANCHIAL CLEFT CYST AND FISTULAS

In reviewing the branchial arch system, it is of clinical importance that the second arch contains the seventh cranial nerve and the platysma muscle, necessitating that the persistent fistulas must pass beneath the two structures (fig. 7).

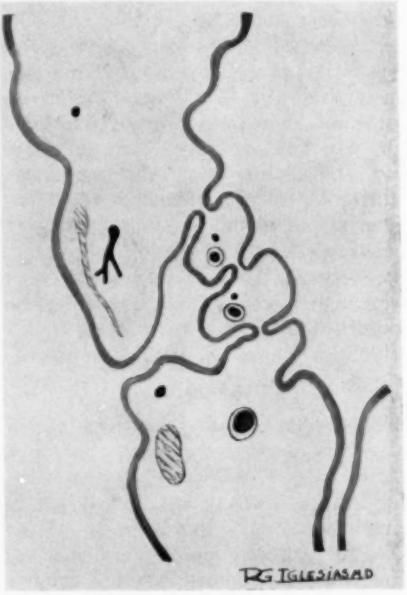

FIG. 7—This diagram summarizes the developmental anomalies associated with the branchial system and the lateral cervical sinus. Note in particular the position of the facial nerve and platysma muscle primordia in the second arch and the hypoglossal nerve and sternomastoid muscle somite in the epicardial ridge. The third arch contains the carotid artery and glossopharyngeal nerve, while the fourth arch contains the arch of the aorta on the left or the proximal portion of the subclavian artery on the right side and the superior laryngeal nerve. (Redrawn from Davies.)

The epipericardial ridge contains the sternocleidomastoid muscle and the twelfth cranial nerve, so the persistent fistula must course ventral to these structures; that is, above the hypoglossal nerve and anterior to the sternocleido-

mastoid muscle. Similarly, the fistulous tract must pass dorsal to the common carotid artery, or in the more common tract which extends to the second pharyngeal pouch in the supratonsillar area, it must pass between the external and internal carotid arteries, or possibly ventral to both.

Four authors have reported this route ventral to the carotid axis which occurred in cases in which all criteria for a second pouch fistula were met. Himalstein offers the following explanation:

> The external carotid does not appear until just about the end of the arch phase in point of time. It is not the artery of the second branchial arch. If the artery is laid down ventral to the stalk of the second pouch (already formed in the preceding arch phase), a persistent pouch or fistula will come to lie between the carotids, as is the usual case. However, if the artery is laid down a fraction of a millimeter in a more dorsal direction (keep in mind the entire embryo is only 13 mm. long at this stage), it will pass dorsal to the pouch, and a persistent pouch or fistula will then come to lie ventral to both carotids. Developmental time lag is this one factor, along with the disappearance of some structures (as the second arch artery), in considering variations from the usual.

In the following paragraphs the three chief theoretical possibilities which might explain the occurrence of persistent cysts or fistulas are discussed. Of these three possibilities, only the one first mentioned has been reported clinically.

Embryologically and surgically the deep connection and route of fistulous tracts from the second pharyngeal pouch can be traced from low in the neck, anterior to the sternocleidomastoid muscle, beneath the superficial cervical fascia and platysma muscle, between the arteries, over the hypoglossal and glossopharyngeal nerves, and to the second pouch area of the tonsillar fossa (fig. 8). Lateral vestigial cysts of the neck most often remain high, whereas the fistulous tract may extend almost to the clavicle and to the sternomastoid muscle.

As an explanaton for this, Himalstein has said:

> It has been shown that fistulae develop most often from a breakdown between the second pouch and the second groove or cleft, which in turn may remain open and form an external fistula. This occurs at the time and place when the arches lie directly against the pericardium, before the neck is formed, and most significantly, when the second cleft opening and rudiments of hyoid, clavicle and infrahyoid and sternomastoid muscles are grouped close together. As the neck forms subsequently, there is considerable expansion cephalad to the relatively stationary base of the neck at the clavicle and pericardial level. When an external opening persists in the ectoderm in this area of relatively slow ectodermal expansion at the base of the neck, it is trapped here, whereas the cephalic attachment in the region of the hyoid and tonsil fossa-to-be pulls away in the ventral expansion, causing the formation of the neck. The fistulous tract is drawn out, as are the infrahyoid muscles. Where no such caudal anchorage occurs, as in a branchial cyst or incomplete internal fistula, the vestige is carried upward or cephalad, maintaining its relations at the approximate hyoid level.

Although authenticated clinical cases have not been reported of a fistulous tract arising from the third pouch, embryologically the route is determined and follows the course above the twelfth cranial nerve posterior to the carotid artery, and through the thyrohyoid membrane above the superior laryngeal nerve, which is contained in the fourth arch (fig. 9). One patient treated by the author had a tract which extended posterior to the carotid artery and was obliterated at the level of the hyoid bone, but it did not extend to the thyrohyoid membrane. It is possible that this was a true case of fistula arising from the third pharyngeal pouch, although it can-

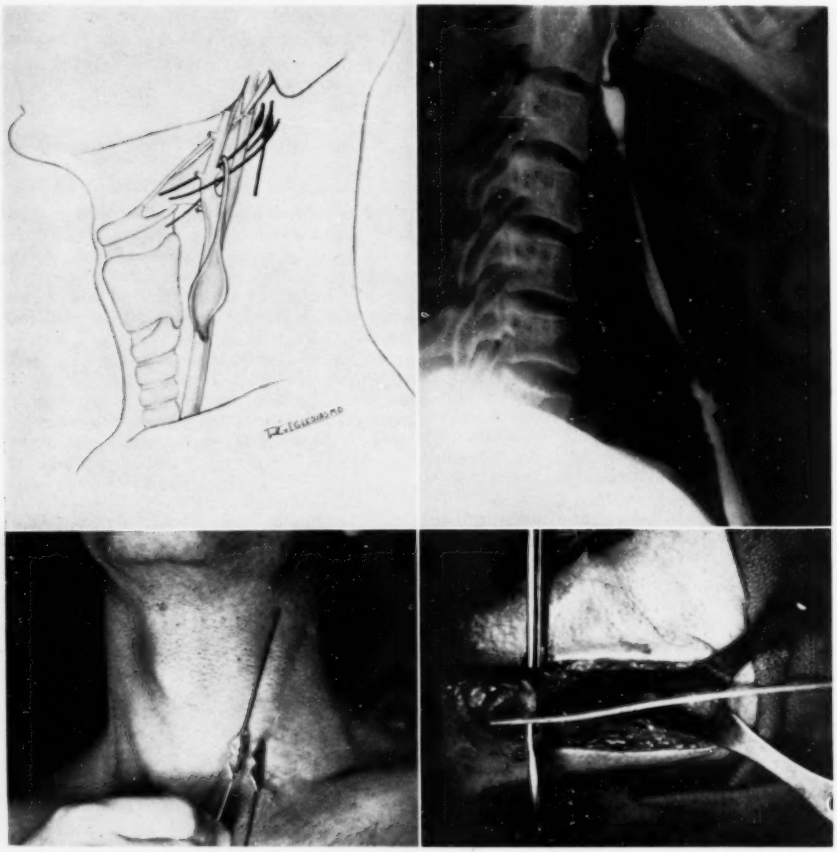

FIG. 8 — (Top, left) This diagram should be compared with Figure 7. The route followed by the fistulous tract may be compared to that in the clinical case illustrated at top, right and at bottom, left. (Top, right) A catheter and radiopaque dye have been inserted into this fistula, which can be seen terminating as a thin line extending to the tonsillar area. (Bottom, left) Insertion of lacrimal probes into the fistulous tract. Note old incision. (Bottom, right) Two transverse ladder incisions are utilized for exposure. This patient had had a vertical incision made previously by a general surgeon for exploration of the carotid artery after an injury. The fistulous tract can be seen extending between the carotid arteries to beneath the mandible. The no. 12 catheter shows the extent to which the catheter could be inserted into the fistula.

not be reported as an authentic case. At the time of surgery, although I was familiar with the embryologic possibility, I was not aware that no case had been reported and did not note the anatomic relations as critically as I would do now.

In the third possibility, the fistula follows a similar course to that described above but passes beneath the superior laryngeal nerve and about the aorta on the left side and the proximal portion of the subclavian artery on the right side (fig. 10). Again, no cases have been re-

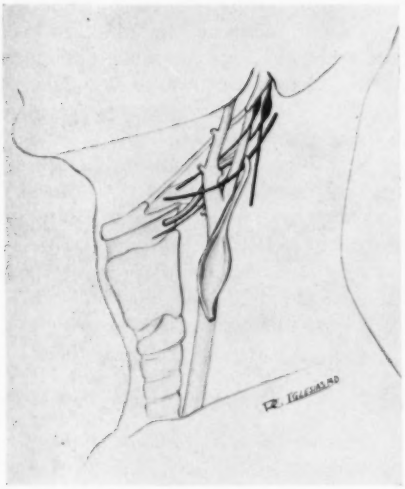

FIG. 9 — This diagram is of the route of a fistula from the third pouch. The course about the carotid artery and through the thyrohyoid membrane above the superior laryngeal nerve is seen. Compare with figure 7.

ported of such a fistula being traced in the neck, but it is certainly a plausible speculation that this embryology accounts for the dermoid cyst found in the superior mediastinum. You will recall that from both the third and fourth pouches, entoderm evaginates and migrates into the chest to form the thymus gland. Excluding this aspect of the development, it may be that ectodermal cysts persist in this area simply from remnants of the cervical sinus and fourth pouch, as I have outlined.

Just as cartilagenous remnants may persist along the mandibular arch-Meckel's cartilage complex, so such cartilagenous appendages appear in the neck in association with the hyoid arch-Reichert's cartilage complex. These appendages may or may not be associated with external fistulas. (See figure 6, bottom.)

For the reasons described, a fistulous tract does not present posterior to the sternocleidomastoid muscle. Although the cyst may appear clinically beneath the muscle or be prominent posteriorly, it is advisable to dissect anterior to the muscle so that a possible internal tract can be better traced and the possibility of leaving residual epithelium-lined tissue reduced. One may see patients with posterior fistulas or, as in one of my

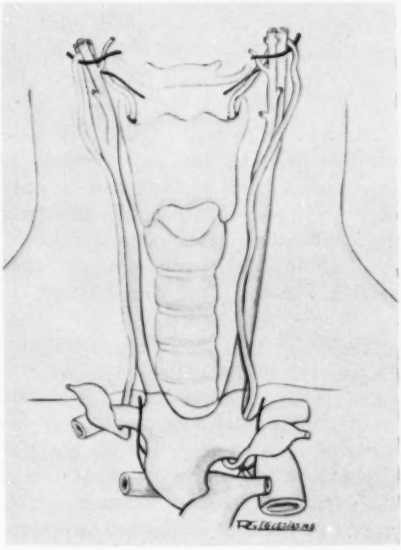

FIG. 10 — The course of the fourth pouch derivatives about the aorta and subclavian artery and entering the pharynx below the superior laryngeal nerve. Compare with figure 7. This source of ectodermal elements may account for superior mediastinal dermoid cyst. No cases of cervical cyst following this course have been reported.

recent cases, fistulas anterior and posterior to the sternocleidomastoid muscle. As in this case, the fistulas usually exist because of ill-advised incision and drainage or incomplete surgery. These false fistulas are often lined with granulations or scar tissue, although they may become secondarily epithelized. Lateral

cysts and fistulas of the neck usually have intimately associated lymphoid tissue, possibly arising from the origin near Waldeyer's ring. This is a helpful point for distinguishing lateral vestigial cysts from the midline thyroglossal duct cyst, which is devoid of lymphoid tissue.

Cervical cysts or fistulas may not become apparent until the infant is older, in which case the problem of timing for surgery is negated. In the situation of an infant with an uncomplicated cyst or fistula, I would advocate a conservative approach of observation until the child is older and can tolerate surgery better. There is no need for haste or for extensive probing of the opening or for incision and drainage of the cyst. This manipulation may lead to infection and force one's hand earlier than is ordinarily necessary. With infection, or for the symptomatic cases, one must use his surgical judgment and operate when necessary, even in the young infant.

The surgical technique is, essentially, careful atraumatic dissection. The anatomic relations emphasized above are taken into consideration here. I do virtually all neck surgery through horizontal incisions. Most often these procedures may be completed through one incision. I have never found it necessary to make more than two limited "ladder" incisions, even for the the low fistulas which must be traced beneath the mandible. The skin near the opening of the fistula must be included with the specimen, and this incision is incorporated with the horizontal incision. The injection of radiopaque dye is unnecessary for satisfactory clinical management and has been used chiefly for teaching or demonstration purposes. One should not depend on the dye to demonstrate always the deep or complete extension of the fistula. The findings at surgery must determine the extent of dissection necessary. I prefer not to stain the tissues with methylene blue or other dyes and feel that such a procedure adds little to satisfactory removal of a fistula. A small catheter or probe in the tract may be helpful in dissection, but it is not necessary. The chief clinical aid is knowledge of the detailed anatomy of the neck and the embryologic course of these fistulas. It is not necessary to explore or lay out each anatomic structure which is encountered; one should know where he is going and avoid these structures.

THYROGLOSSAL DUCT CYST

The surgical principles and timing for the surgery outlined above apply also to the midline cervical cyst. In the area of the foramen cecum there is a vestigial lingual duct which may be carried with the thyroglossal tract, thus making, on occasion, what is more accurately a tract —for practical purposes, a true duct (fig. 11, top). In its course, to contribute to the pyrimidal lobe, isthmus, and medial aspect of the lateral lobes of the thyroid gland, the thyroglossal tract passes ventral to the hyoid bone but may be entrapped within the hyoid arch. For clinical purposes, the tract or duct may pass anterior to, through, or posterior to the hyoid bone, but ventral to the thyrohyoid membrane. It is advised, therefore, that one dissect from below up on the membrane which attaches superiorly and posteriorly to the body of the hyoid bone. An adequate section of hyoid must be removed with the specimen (fig. 11, bottom). One must determine whether the thyroid tissue associated with the persistent thyroglossal duct is all that the patient has and be prepared to manage the case accordingly. Patients with a lingual thyroid only are not unusual.

In our attack on any of these masses, we must keep in mind the full complement of pathological conditions consid-

ered in the differential diagnosis of tumors of the neck and be prepared to handle any of them. Malignancy must, of course, be kept in mind; if found, the primary lesion must be sought. Neither I nor any of my teachers has ever seen a carcinoma arising from a congenital cyst. A diligent search for the primary lesion with repeated examinations, even months after a radical neck resection, if necessary, is the physician's responsibility. In reviewing the development of the thyroid gland from the base of the tongue and from the third and fourth pouches, it is apparent that aberrant thyroid tissue may occur in the neck. "Aberrant thyroid malignancy," however, must be considered metastatic and the thyroid gland itself should be critically evaluated by clinical and surgical examination.

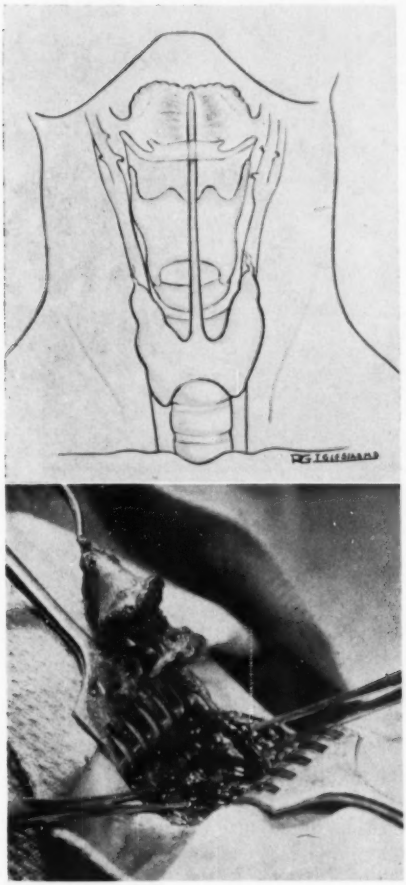

FIG. 11—(Top) The thyroglossal tract of entodermal origin descends into the neck from posterior to the tuberculum impar and anterior or ventral to the second arch hyoid bone. Clinically, the tract may be entrapped in the hyoid bone or even posterior to it. For practical purposes it may be dissected from the thyrohyoid membrane which inserts posteriorly and superiorly on the hyoid bone.

(Bottom) The surgical removal should include an adequate section of the hyoid bone and the tract traced through the raphe of the mylohyoid muscle to the area of the foramen cecum. The surgeon should determine if either the associated pyramidal lobe or lingual thyroid are the only functioning thyroid glands the patient has.

A few other anomalies of the neck, which are of developmental origin will be dealt with in brief.

CERVICAL CYSTIC HYGROMA (HYGROMA COLLI CYSTICUM)

Cystic masses of this type probably arise from sequestration of embryonic lymphatic tissue. They are filled with clear fluid and may attain great size, producing symptoms of respiratory obstruction or even brachial plexus irritation (fig. 12). When they are associated with upper respiratory infections, quite toxic symptoms may be produced or the complication may become fatal. There is a tendency for these tumors to insinuate themselves between and to encompass the major structures of the neck. In this process, lymph nodes may be surrounded and therefore inadvertently included in the excised specimen. The multiloculated cystic spaces are lined with endothelium. A severe macroglossia may occur when there is involvement of the floor of the mouth and tongue, with the result being a dry, inflamed and fissuring tongue. These tumors may be quite large at parturition,

FIG. 12 — Hygroma colli cysticum may progress to enormous size, producing severe macroglossia, respiratory obstruction, and brachial plexus irritation. Severe cases such as this may require staged removal, with initial attention being directed to the lingual involvement.

and a tracheotomy on the newborn infant may be imperative.

If the cystic mass has not been disturbed by infection or incomplete surgery, it may be quite readily removed from the surrounding structures by delicate dissection. The surgical challenge is made more grave by the magnitude of this major dissection about the vessels and nerves of the neck in a small child. In extensive tumors, particularly those involving the floor of the mouth and tongue, it is advisable to plan the operation in more than one stage. I have removed large tumors in one operation, but the death of one infant on the fifth postoperative day (after overcoming the embarrassment of major surgery), probably as a complication of the tracheotomy, has made me reluctant to take extreme measures in the newborn infant. Some have advocated the preliminary use of a sclerosing solution on these tumors, to be followed by surgical intervention. As surgery remains necessary and because of the possible increased adherence to the major structures, this does not seem desirable to me, although I have had no personal experience with it.

LARYNGOCELE

This tumor is of congenital origin, arising from herniation of the laryngeal appendix or pouch (ventricle of Morgagni). It may present into the lateral neck and be mistaken for a branchial cyst. In a recent case managed by the

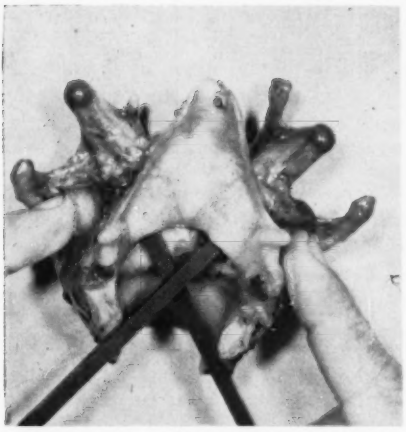

FIG. 13 — This specimen was removed for carcinoma of the larynx but clearly demonstrates the course of bilateral laryngoceles extending from the ventricle of Morgagni over the thyroid cartilage. When symptomatic, removal of laryngoceles is advocated through a transverse external incision.

author, the child had been operated upon for a lateral cyst, but the stalk severed external to the thyrohyoid membrane. The persistent air sac could be demonstrated. Removal was accomplished by a thyrotomy approach because of an associated but uncommon benign adenoma of the false vocal cord. The adenoma was removed with an adequate margin and the dissection from this internal approach carried over the rim of the thyroid cartilage to the area of scarring from the previous surgery. Laryngoceles have been reported associated with tumors of the larynx. It is possible that the mass could contribute to the development of this herniation by obstruction. In the case illustrated by figure 13, the diagnosis had been carcinoma of the larynx.

Large air spaces may be demonstrated by roentgenologic examination while the patient performs the Valsalva manuever. Although this benign herniation may be asymptomatic, symptoms from pressure, the accumulation of debris, or infection may occur and require its removal. The recommended surgical approach is again through a transverse external incision, dissection being accomplished via the external presentation of the air sac. The stalk can usually be dissected through the thyrohyoid membrane and over the cartilage before ligation. Care is taken to preserve the superior laryngeal nerve, but the artery is ligated.

CONGENITAL WEBBED NECK (PTERYGIUM COLLI)

This unusual deformity is manifest in the shortening and contraction of the deep cervical fascia along the anterior border of the trapezius muscle extending from the mastoid tip to the acromion. In repairing this deformity, I have used a slight modification of Dingman's *Z* plasty. In brief, a single large *Z* incision is performed, with one flap based anteriorly and the other posteriorly. In this procedure, no tissue is removed except the thickened fibrous tissue. The chief disadvantage of this method is the tendency of the scars to widen in the area over the large muscles and thicker skin at the back of the shoulder. In the cases of bilateral webbing, the procedure is done in two stages, six to eight weeks apart. Other anomalies may be associated with this deformity, particularly anomalies of the external ear and ear canal.

DERMOID CYST OF THE NECK

These cysts are usually more superficially located than either the branchogenic or thyroglossal cysts and do not extend to the pharynx. The doughy consistency is helpful in distinguishing the dermoid from cystic hygroma. In either case, surgery is the treatment of choice. Sectioning the dermoid will reveal that

it contains hair and other epithelial elements indicating its teratologic origin.

ADDITIONAL ANOMALIES

Space does not permit a detailed coverage of all the many interesting anomalies of the face and neck, but a few additional conditions are mentioned for review.

Chordomas which arise from the development of the notochord may be encountered. The development of this anlage of the mucoid core of the vertebral disc is most interesting. In its position between the spinal column and the basiocciput at the apical ligament, the notochord is in immediate relation to the pharyngeal mucosa, making this area particularly favorable for the occurrence of these tumors.

Craniopharyngiomas may develop along the neural and pharyngeal components involved in the development of the hypophysis. Rathke's pouch from the stomodeum forms the craniopharyngeal canal. Ectodermal remnants from the anterior lobe of the hypophysis compose the neural elements, and cysts or tumors of the hypophyseal primordia are not infrequently seen.

Anomalies of Rathke's ectodermal pouch should be distinguished from those of the *pharyngeal bursa,* situated further posterior in the nasopharynx and arising as a diverticulum of entoderm from the foregut.

Dentigerous cysts are formed from unerupted enamel organs; the cystic mass classically surrounds a developed enamel organ. These cysts should be distinguished from cystic odontomas arising from both mesoderm and the enamel organ and enclosing elements of both the root and crown, and radicular cysts which are due to infections and not to faulty development. You will recall that the enamel organ is formed of ectoderm buried in the mesoderm of the alveolar process. Except for the enamel, the tooth is derived from mesodermal elements.

Ranulas result from occlusion of the salivary duct of either the sublingual or submaxillary gland with the formation of a thin-walled cystic mass. This cyst may either be excised or marsupialized.

Hygromas or cavernous lymphangiomas may occur independently in the area of the mouth; when involving the tongue, they are referred to as macroglossia, and when the lip is involved, macrocheilia. As with the cervical hygromas, the earlier the tumor is removed the less likely recurrences are to develop.

SUMMARY AND COMMENTS

The purpose of this paper has been to review congenital anomalies of the face and neck which one is likely to see in clinical practice, and to correlate the embryology of these anomalies with clinical management. Certain principles of surgical planning relative to growth potential have been outlined. The practical aspects for the practitioner have been kept in mind. Details of surgical technique have been limited. It is the author's hope that this general survey, which includes some original principles, will aid the reader in a rational approach to the correction of these anomalies and serve as a stimulus for more detailed study. With an awareness of the possible developmental defects, the surgeon will be on guard for unusual situations and, as a result, will report his findings for the enlightenment of us all. The otolaryngologist is urged to acquaint himself with these clinical conditions so directly related to his specialty.

I would like to stress the variety of circumstances which may surround any one developmental derangement, and place emphasis on the constant need for individualization in analysis and flexibility in technique.

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DISCUSSION

A. C. FURSTENBERG, M.D., Ann Arbor, Michigan: A correlation of present day knowledge of tumors and cysts of teratologic origin is important to all of us in otolaryngology. Dr. Farrior has grouped those lesions of unusual interest, ascribing to them pertinent clinical data of practical value to an audience primarily interested in the practice of clinical medicine. I compliment him highly on the excellent manner in which he has emphasized the many important aspects of this subject.

I should like to comment briefly on only two of the lesions to which he has referred: the branchial cleft cyst and the ranula.

The branchial cyst represents an unclosed portion of the second or third branchial cleft and is found on the side of the neck. These cysts are usually lined by columnar ciliated epithelium, although they may contain stratified epithelium. Dr. Farrior has stated that he has never seen one of these lesions undergo malignant degeneration; however, there is some evidence that this does occur occasionally. Dr. Eggston, the pathologist in New York City, has brought this observation to our attention, and Dr. Willis, the British pathologist, has emphasized this possibility in dealing with this teratologic lesion.

When you find a metastatic lesion in the neck and you have searched diligently for the primary source in the nasopharynx, pharynx or hypopharynx but to no avail, keep in mind the possibility of the occurrence of a malignant lesion of branchiogenic origin. We must be ever cognizant of the part played by branchiogenic lesions in the production of a squamous cell carcinoma arising primarily within the cervical region and not associated, as is usually observed, with a primary lesion in the upper food or air passages.

The second lesion to which I refer is the ranula. It is difficult, if not impossible, to classify properly the large variety of swellings which develop within the floor of the mouth. The term *ranula* has been employed

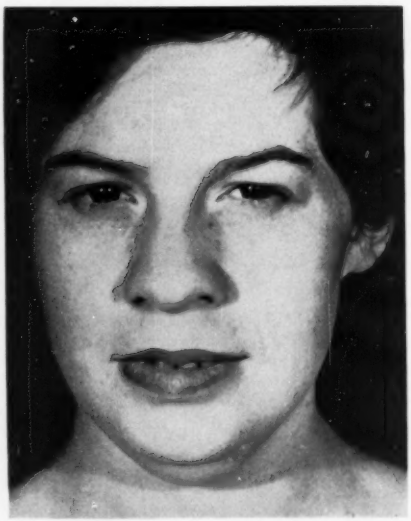

FIG. 1 — True ranula, a lesion of teratologic origin. Note submental swelling.

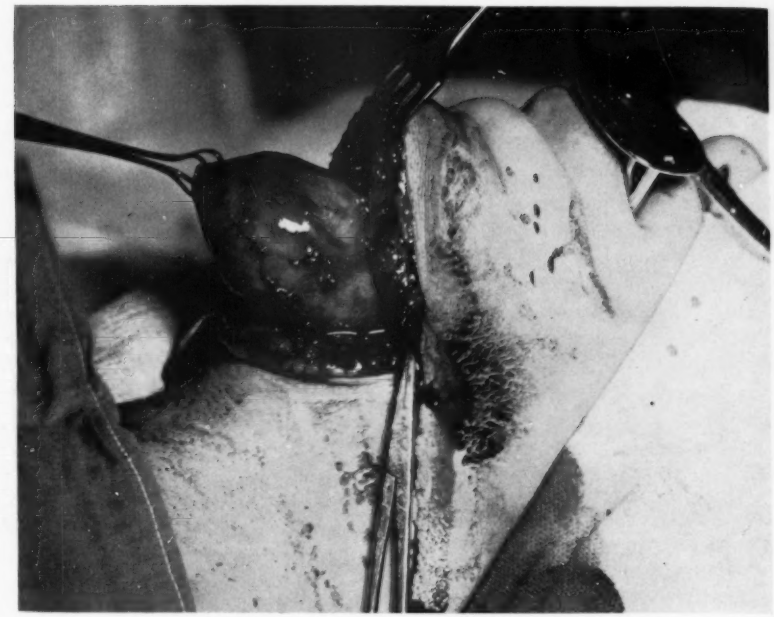

FIG. 2 — Surgical approach for removal of a true ranula.

in a loose sense to include a wide range of cystic swellings in connection with the sublingual, submaxillary and mucous glands or those derived from some disturbance in the closure of the second branchial cleft. The ranula which appears as a thin, glistening, cystic swelling of glandular origin does not belong to the teratomas. It is an acquired change in which the pathological process is a myxomatous degeneration of one of the numerous glands in the floor of the mouth after occlusion of its duct.

Not all cysts found in the floor of the mouth and submental region are derived from this source. Some are undoubtedly of teratologic origin and represent heterotopias or dystopias of pharyngeal mucosa, as observed in the branchial cysts. The ranula of teratological origin, which might properly be called a true ranula, is a large lesion in the floor of the mouth under the tip of the tongue with evidence of its presence, also, externally beneath the skin and subcutaneous tissue of the submental region (fig. 1). It represents more than one layer of the embryo and is obviously due to some disturbance in the fusion of the first or second branchial arches in the sublingual area. This encapsulated lesion is removed surgically through an external incision below the symphysis of the mandibles (fig. 2).

With these few remarks I want to compliment Dr. Farrior again on bringing to us so many of the practical aspects of this important subject.

DR. FARRIOR: To any group any place I would say that the burden of proof on the head and neck surgeon with a so-called primary carcinoma in the neck is to find the primary lesion at some site above. For all practice purposes this is your challenge — to look for another primary site rather than use a branchiogenic carcinoma as your "out."

I would like to say how much I am honored that Dr. Furstenberg was invited to discuss this paper, and may I also say how much I am indebted to him for allowing me to come to an Academy meeting with his residents when I was an intern on his service, thus giving me my first introduction to this highly honored society.

THE MUSHROOM GRAFT

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THE use of a combined lamellar and perforating corneal graft was first described by Franceschetti and Doret in 1950.[1] Because of its suggestive shape they called it a mushroom graft. They felt that it combined the trophic and other advantages of lamellar grafting with the visual advantages to be gained from a perforating central button, and considered it especially useful in heavily vascularized, or otherwise badly damaged, corneas.

Such an ingenious type of corneal graft has an unusual appeal in appearing to offer relative safety for very large lamellar replacement of opaque and diseased corneas, plus the visual advantages of a small, full-thickness button. Its usefulness would seem to apply to very extensively scarred or highly vascularized corneas, such as may result from old penetrating ulcers, from extensive chemical burns, from previous unsuccessful penetrating grafts, or indeed wherever a very large graft is needed. Its greatest usefulness, however, is probably in aphakic eyes, whether the graft is needed for bullous keratopathy, or for other corneal opacification, or for irregularity resulting in a painful cornea. Here, in particular, the mushroom graft appears to offer greater safety, especially from the danger of extensive vitreous loss, plus a penetrating central button for better vision.

The larger healing area offers intriguing possibilities for quicker and more secure sealing of the wound and, therefore, quicker mobilization of the patient. It may also offer an interesting opportunity for the study of the healing process in grafts, and a possibly safe place for use of preserved corneas, which is demonstrated to be successful in lamellar grafts.

Performing the mushroom graft with ordinary instrumentation would appear formidable. Franceschetti devised a mechanical cutter for the donor graft which is ingenious, but it is rather difficult to use and traumatic to the tissue, especially to the corneal endothelium, which Stocker[2] has pointed out to be of primary importance in the healing of corneal grafts. Stocker, in 1958, markedly furthered the cause of the mushroom graft with a technique which he devised, using marking calipers and multiple trephines. However, this technique, with which he has had considerable success, requires undue technical dexterity and is likely to result in imperfect matching of the graft to the recipient bed. However, it rightly emphasizes protection of the endothelium of the penetrating button.

From the Department of Ophthalmology, Bowman Gray School of Medicine.

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Presented as a *Motion Picture* at the Sixty-Fifth Annual Session of the American Academy of Ophthalmology and Otolaryngology, Oct. 9-14, 1960, Chicago.

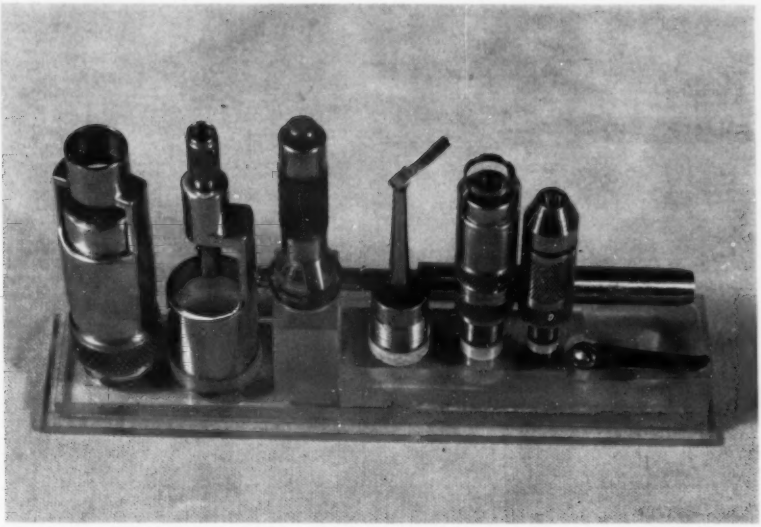

FIG. 1—Mushroom corneal graft instrument set, mounted on plastic carrier. (Left to right) Fixing block and trephine guide; fixing cylinder and guide; "cookie cutter" 15-millimeter trephine; 10-millimeter trephine with guide for 5-millimeter trephine; 5-millimeter trephine. (Rear) Suction cylinder for fixation on recipient cornea.

Our technique involves new instrumentation which should make the operation easy for any reasonably good ophthalmic surgeon, which will produce perfectly fitting donor grafts and recipient beds, and which spares the donor cornea any undue trauma to the endothelium, which is subjected to no direct contact during the performance of the operation. The instrument system (figs. 1, 2, and 3) uses combined mechanical and suction fixation, calibrated outside guards on the trephines, which are made with the bevels on the inside, and guiding devices to place the trephine cuts in both donor and recipient corneas. These make possible the easy achievement of accurately fitting grafts and donor beds, as has been demonstrated on many experimental animals on Eye Bank eyes, and in initial clinical trials.

While lamellar and penetrating cuts of any reasonable relative size might be done, we have found it most convenient and feasible to use an instrument system which includes a 10-millimeter trephine to make the outer cut for the lamellar portion of the graft, with a 5-millimeter trephine for the inner or penetrating portion of the graft. This has been most suitable to cover almost the entire cornea without getting into loose conjunctival tissue, as may so readily be done with a larger graft, and has also permitted an adequate penetrating window with a sufficiently large and easy to work with ledge outside this window. If, for any reason, larger grafts of 11 or 12 millimeters should be desired, the instrument system can readily be made up to fit such needs.

The recipient eye is first prepared (figs. 4 and 5). The outside guard on

FIG. 2—Suction fixing base for mushroom corneal graft, with steel-toothed fixing ring and trephine guide, separate and assembled.

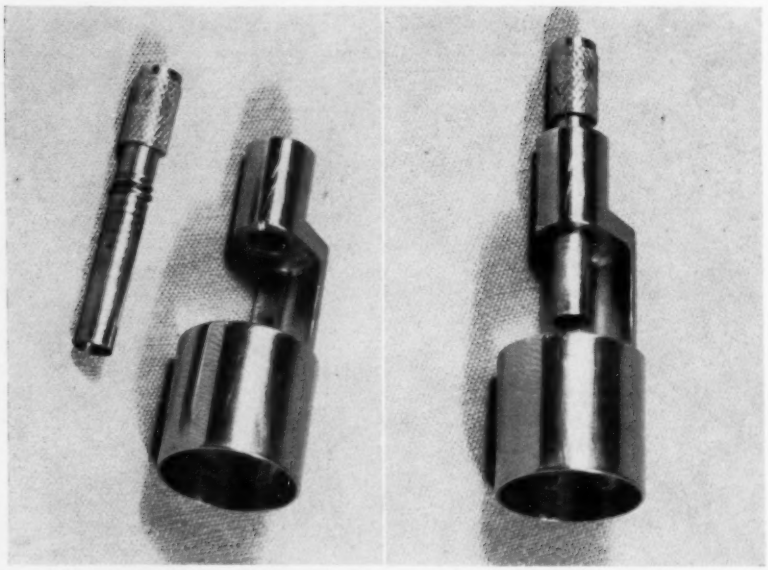

FIG. 3—Fixing device for dissection of endothelial surfaced lamellar ring around penetrating core of mushroom graft, separate and assembled.

the 10-millimeter trephine is set for the desired depth of the lamellar cut, and the cut is made either using the trephine alone or using it over a close-fitting hollow, central, cylindrical core, with a concave perforated foot plate adapted to the corneal curvature, which is placed against the corneal epithelium. This Took, or other dissecting knives which may be suitable for the purpose. The additional central cut of the 5-millimeter trephine has made it possible to evaluate more accurately the thickness of the badly diseased corneas used in our initial tests, and also has made the lamellar dissection easier by making it possible

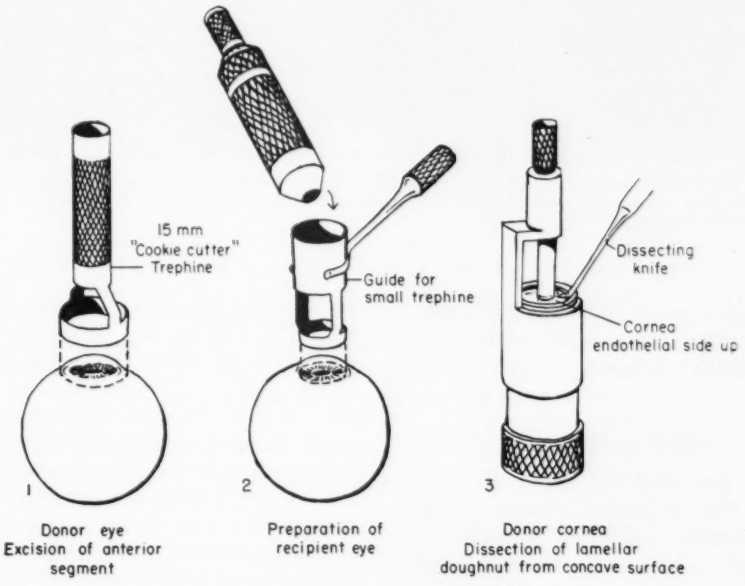

FIG. 4—Details of instrumentation in mushroom corneal graft operation.

guiding core is attached to light suction in order to provide a guide for the trephine and to permit no creep in turning the large trephine, thus assuring a perfectly round cut. After this initial cut with the 10-millimeter trephine is made, we have found it convenient to use the unsharpened fixing ring with the guiding cylinder into which the 5-millimeter trephine will fit, in making a central 5-millimeter cut of the same depth as the outer cut. Following this, the lamellar dissection of the outer layers of the recipient eye is made, using Paufique, to work from the center as well as from the periphery in doing this dissection. Following removal of the lamellar layer, the preparation of the recipient eye for reception of the graft is completed by again using the 5-millimeter trephine within the guiding ring which fits in the 10-millimeter cut to make a full penetrating cut to remove the central button. If necessary, this cut is completed with scissors. In the actual performance of the operation it is preferable to leave this final removal of the penetrating 5-millimeter central button until the graft

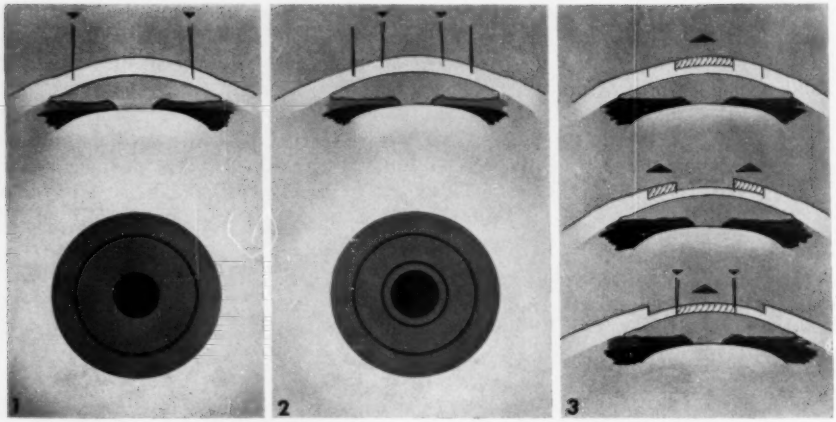

FIG. 5—Preparation of recipient eye. (1) Marking depth and extent of lamellar cut with 10-millimeter trephine. (2) Marking central depth with 5-millimeter trephine. (3) Lamellar dissection and penetrating cut with 5-millimeter trephine.

has been prepared, in order to leave the recipient eye in a safer condition while the graft is prepared.

THE PREPARATION OF THE GRAFT

In preparing the mushroom graft itself (figs. 4 and 6), the entire anterior segment of the donor eye is removed, using a large 15-millimeter trephine made like a "cookie cutter," which allows better visualization of the cut and placement of the trephine, and facilitates marking and partially excising the anterior segment. The excision is completed with scissors. This anterior segment is then peeled off the anterior uvea, usually freely, but if necessary with the aid of gentle separation with a spatula. The excised anterior segment is then placed, concave or endothelial side up, on the fixing block, a cylinder with a concave upper surface made to simulate the curvature of the human cornea. Multiple small perforations lead to the hollow core of the fixing block which in turn is connected to a base and suction outlet to permit pulling suction on the epithelial surface of the cornea, holding it firmly to the surface of the fixing block (fig. 2). The anterior segment of the donor eye is centered accurately, the suction is turned on, and fixation is then made absolute by pulling a stainless steel ring with downward-pointing, small teeth, over the upper end of the block and the donor cornea. The teeth fix into the small scleral rim outside the donor cornea around its entire circumference and permit no slipping of the eye on the fixing block during further dissection.

A trephine guide is then slipped over the cylindrical fixing block so that the trephines, which fit within this guide to close tolerances, are held perfectly perpendicular and centered above the endothelial surface of the excised anterior segment of the donor eye. The 10-millimeter trephine then is set for the desired depth, as estimated from the depth of the lamellar cut made in the recipient eye and the normal corneal thickness,

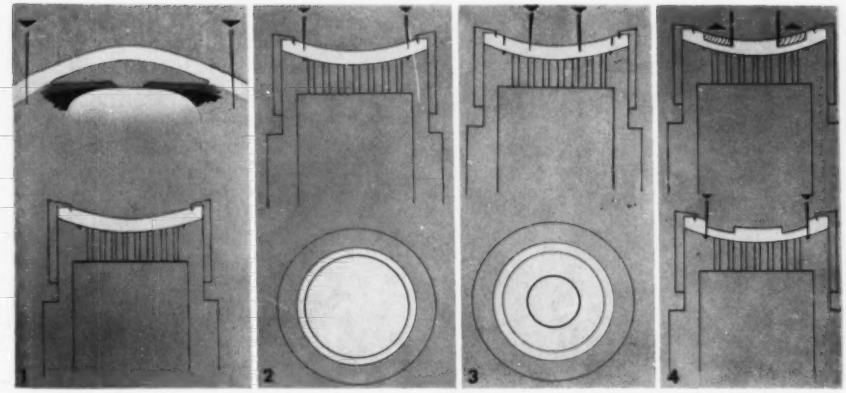

FIG. 6—Preparation of graft. (1) Excision of anterior of donor eye and placing, endothelial side up, on fixing block (2) Marking of lamellar depth and extent on graft (10-millimeter trephine). (3) Marking of penetrating button (5-millimeter trephine). (4) Dissection of lamellar doughnut around fixing cylinder.

and the trephine is turned to make this initial cut. The 5-millimeter trephine, with the guide set to the same depth, is then inserted through the same guide, which centers it perfectly within the 10-millimeter cut. The cut is then made into the endothelial surface, leaving the endothelium on the penetrating button completely untouched by instruments. The trephines are removed. A thin, unsharpened cylinder, which is essentially a thin-walled, unsharpened trephine threaded to fit its guide (fig. 3), is screwed down into the cut of the 5-millimeter trephine. This provides protection for the walls of the penetrating button and even more absolute fixation during the dissection of the doughnut of lamellar tissue, which must be removed between the 10-millimeter and 5-millimeter cuts.

Dissection is carried out, dissecting from the 10-millimeter cut toward the center with appropriate knives. The inward dissection is limited by the protecting cylinder. Since the fixing block itself and the guiding device for the fixing cylinder may both be readily rotated, this dissection is easily carried out with a minimum of inconvenience in movement of the operator's hands, making possible accurate and uniform dissection of the endothelium-surfaced doughnut of corneal tissue. After the doughnut donor ring of tissue is removed, the fixing 5-millimeter cylinder is then removed and the 10-millimeter trephine is again applied through its guide to complete excision of the graft from the excised anterior segment of the donor eye. The guide is set to permit a penetrating cut of the 10-millimeter trephine, and this cut is then made over the fixing block, which has a groove at this 10-millimeter circle into which the trephine cuts and thus avoids dulling the blade, since it actually touches none of the block itself. Upon completion of the penetrating cut, the trephine and the outer scleral rim with its metal fixing ring are removed, leaving the completed graft endothelial side up on the fixing block. This is then removed and inverted into the completed recipient bed and sutured into place with appropriate sutures to give firm fixation in the bed (fig. 7).

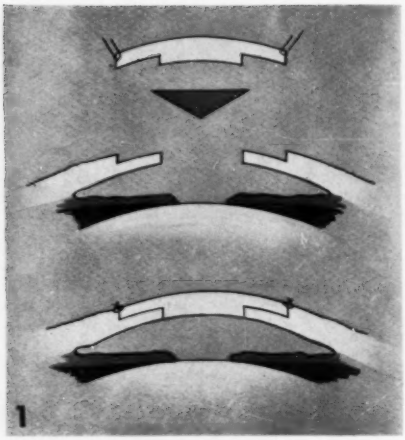

FIG. 7—Placing of graft in recipient cornea.

With the guides described, these maneuvers have been found to be relatively foolproof and simple to accomplish, and have left, as the most difficult part of the operation, lamellar dissection in the recipient eye, which is otherwise no different from a lamellar dissection in any badly scarred cornea.

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SURGICAL ALTERATIONS OF THE LARYNGEAL LYMPHATICS

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BY INVITATION

DURING the waning years of the nineteenth century and passing into the beginning decade of the current century, investigative interest aimed at clarifying the pathways concerned with laryngeal lymphatics was at its peak. A number of studies including those of Roubaud,[8] Poirier,[5] and Cuneo[1] gave ample support to the hypothesis that the lymphatic drainage occurs in a homolateral fashion. Employing vital dyes for ease in visual observation, these authors noted that the larynx was composed of two equal halves, divided by a physiologic midline barrier, and that each hemilarynx had its individual channels to the ipsilateral internal jugular nodes. They noted occasional extension across the midline by the diffusion of the dye; in general, however, the passage of the dye to the regional nodes was toward the side of the greater concentration. A few exceptions to the concept of homolaterality were recognized and admitted. In contrast to this strict concept, Quiret[6] reported a small series of experiments in which he found that contralateral movement from a subglottic test site had indeed occurred in 30 per cent of the experiments. For the reason that the test site was inadequately defined in his report, the impact of this important observation was lessened. Quiret's opinion and findings were later corroborated by Rouviere,[9] who established the possible existence of direct communication between the lymph channels of one half of the larynx and the nodes of the opposite internal jugular chain.

The inherent shortcomings of these dye techniques with the obvious limitation of visual observations, either gross or microscopic, and the wide acceptance of the concept of homolaterality of lymph drainage terminated further investigation along these lines. Recent advances in related fields have furnished the techniques for a precise investigation of this concept.

In the interim, we have witnessed progress in laryngology. The radical neck dissection operation, based on these fundamental studies, has been added to the surgical armamentarium.

The recent clinical reports of Jesberg,[2] Reed and his colleagues,[7] Ogura,[4] and Norris,[3] who found unexpected contralateral metastases from lesions well confined to the opposite hemilarynx, cast doubt on the universality of this classic opinion. In the two cases described by Jesberg, epidermoid carcinoma from a definitely unilateral tumor involving the false cord and the base of

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the epiglottis in the first case, and involving the periarytenoid area in the second case, metastasized to the contralateral cervical chain in fourteen and twenty-three months respectively. In neither of these cases did ipsilateral metastases develop. In the large series of cases reported by Reed, 9 per cent of the laryngeal and hypopharyngeal neoplasms presented contralateral primary metastases, though they did note that contralateral metastases were rare from lesions within the lumen of the larynx. In the comprehensive surgicopathologic survey reported by Ogura, we find reiteration of that same point: crossed metastases were not observed to originate from the area which he designates as endolaryngeal. However, crossed metastases were found in 10 per cent of unilateral extrinsic and subglottic carcinomas requiring secondary neck dissection on the remaining side. In his critical analysis of surgical failures, Norris reports that in 25 per cent of thirty-two cases of unilateral carcinoma involving the vestibular, marginal or hypopharyngeal areas contralateral metastases developed following simultaneous laryngectomy and neck dissection.

While these theoretically misdirected metastases are not the primary concern of the laryngologist, and do not suggest a radical departure from the currently accepted programs of therapy, nonetheless, they do occur with sufficient frequency to prompt the reinvestigation which we have undertaken. It is our purpose to define in the laboratory situation these three areas of uncertainty:

1. *What is the pathway of lymph drainage in the normal test animal?*
2. *What pathophysiologic compensation takes place in the animal having been subjected to a unilateral cervical lymphadenectomy?*
3. *What is the duration of these alterations?*

TECHNIQUE

Radioactive gold (Au^{198}) prepared in the form of a stable, cherry red colloid concentrate was selected to act as a tracer substance for several reasons. The radioactive particles, which are approximately 3 millimicrons in diameter, act as foreign bodies that are rapidly carried to the regional lymph nodes and phagocytized by the subcapsular reticuloendothelial cells. Following injection, a blue hue at the site of injection immediately becomes apparent, thereby allowing a semiaccurate appraisal of the true site of injection. In tracer amounts, its radiation produces little tissue reaction. External scanning, using a scintiscanner* allows external detection of the lymphatic dynamics. Measuring the radiation emission in the well-type scintillation counter† provides quantitative measurements of endolaryngeal diffusion and lymphatic transport of the radiogold with a high degree of accuracy. These advantages supersede by far the limitations of the older methods of microscopic analysis.

The larynx of the dog is ideally suited to the purposes of this experiment by virtue of its similarity in tissue mass and proportions to the human larynx. More important, there is only one node—the suprapharyngeal node—in each deep cervical chain responsible for collecting the lymph outflow from the larynx. In this sense, the common canine's neck may be looked upon as a larynx-lymph node preparation. While a few small nodes are found at the cephalic and caudal extremes of the cervical area, they are not related to laryngeal structures.

After many preliminary experiments to ascertain the optimal volume, it was found that 0.015 milliliter of the radio-

*NRD Instrument Company, Model 31, St. Louis.

†Nuclear Chicago, Model 132.

gold could be injected submucosally without diffusion into the opposite hemilarynx in the majority of cases. The colloid was measured and injected from a shielded tuberculin syringe fitted to a 23-gauge tonsil needle. The activity of this dilution ranged from 160 to 400 rc.

FIRST PHASE

In the normal test animals, representing the control series, this small volume of test material was injected into one of the three laryngeal areas: supraglottic, cordal, or infraglottic. The fate of the substance was followed, using both the scanning technique and postmortem fractional measurements of gold-containing tissue. The second group of animals had been previously subjected to a homolateral cervical lymphadenectomy were studied in the same fashion.

Under barbiturate anesthesia, the supraglottic and cordal areas were readily available for examination and precise injection employing the Jackson laryngoscope. The infraglottic area was less accessible, so a low tracheotomy with laryngoscopic illumination and visualization was found to be more satisfactory while not disturbing the important structures.

Forty-eight hours after the injection, the animals were sacrificed and a scintigram obtained in the frontal and lateral positions. The neck was then dissected, removing the larynx and the carotid sheath and their contents, and the neighboring soft tissues. In no instance was the tracer substance found in the liver or other remote areas of the animals. The larynx was divided vertically in the

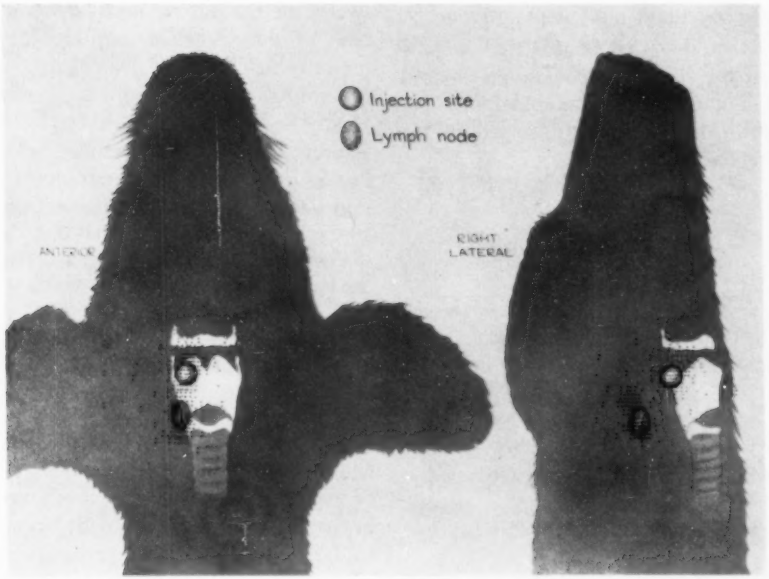

FIG. 1—Scintigram demonstrating the movement of Au^{198} from the supraglottic area to the homolateral suprapharyngeal lymph node in a normal dog.

anterior and posterior midlines. The relative amount of the radioactive material in each hemilarynx and the suprapharyngeal nodes was measured in terms of percentage of the total recovered gold.

Results

Supraglottic Area. The site of injection in the supraglottic area is in the false cord midway between the anterior midline and arytenoid cartilage. During the introduction of the dye, pigmentation is observed to dissect subepithelially, outlining a triangular area with the apex directed anteriorly. After forty-eight hours, the animals were sacrificed and the scan which was taken showed a well defined area of radioactivity posteriorly and laterally to the injection site (fig. 1). This movement is not striking when the scan is taken in the anterior-posterior direction because of the proximity of the gold containing structures in that plane, but it is immediately apparent on the lateral scan. The necks were then dissected for fractional analysis of the structures containing gold. It was found that approximately 50 per cent of the gold had migrated to the suprapharyngeal nodes.

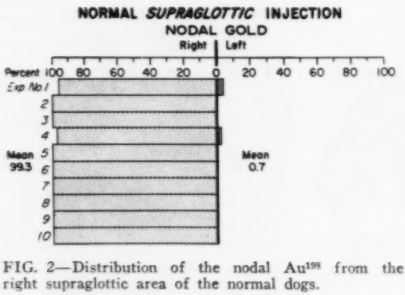

FIG. 2—Distribution of the nodal Au^{198} from the right supraglottic area of the normal dogs.

Figure 2 shows the results of such an analysis of ten dogs. The vertical bold line beneath the 0 percental mark represents the midline. The bars on the right side represent that amount of the total nodal gold which has collected in the right suprapharyngeal node. The bars on the left represent that fraction of the extralaryngeal test substance moving to the left suprapharyngeal node.

Lymphatic drainage from the right supraglottic area is seen to be purely a unilateral phenomenon in eight of the ten test animals, while the remaining two show a 5 per cent and a 2 per cent movement to the contralateral deep jugular chain. The mean homolateral movement from the supraglottic area is 99.3 per cent, while the mean contralateral movement is 0.7 per cent.

Cordal Area. The injection into the true vocal cord was accomplished with more difficulty than in the other area. The needle was introduced halfway between the anterior commissure and the base of the arytenoid cartilage. In the majority of cases, the dye could be seen distending the epithelium overlying Reinke's space, though in a few instances the injection was made into the vocalis muscle. The scintigram of the radioactivity is identical with that of the supraglottic area except that the depot site was more caudad, corresponding to the location of the true vocal cord.

Figure 3 shows the relative movement of the radiogold to each of the deep cervical chains in this group of ten animals. Half of these animals show a decidedly unilateral lymphatic outflow, while the remaining five show bilaterality of drainage. In these last five experiments the percentage of extralaryngeal gold in the left suprapharyngeal node ranged from 3.0 per cent to 26.0 per cent. The mean movement to the right

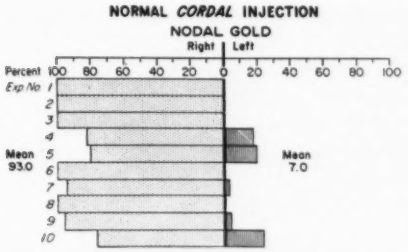

FIG. 3—Distribution of the nodal Au^{198} from the right cordal area of the normal dogs.

and left suprapharyngeal nodes was 93.0 per cent and 7.0 per cent respectively.

Infraglottic Area. The tracer material was introduced via a low tracheotomy incision into the infraglottic tissue approximately eight millimeters posterior to the anterior commissure. This point is halfway between the anterior commissure and the base of the arytenoid cartilage in the majority of mature dogs. The configuration of the depot site in this area was roughly circular or rectangular, corresponding to the shape of the subglottic area. The scintigram of the extralaryngeal movement of the radiogold was essentially the same as that of the supraglottic area.

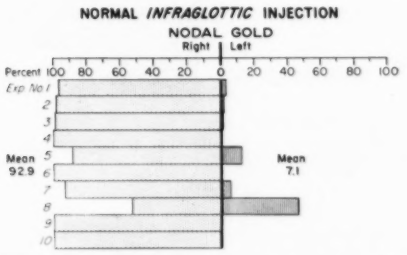

FIG. 4—Distribution of the nodal Au^{198} from the right infraglottic area of the normal dogs.

Lymphatic drainage from the subglottic area is predominantly a homolateral occurrence, while more variability in the pattern is observed (fig. 4). Six animals had bilateral drainage. The amount moving to the left was small in each case, except in experiment 8. The range of movement to the contralateral node was from 1.7 per cent to 46.8 per cent. The mean movement to the right in this series of ten animals was 92.9 per cent. The mean movement to the left was 7.1 per cent.

SECOND PHASE

The second phase of this investigation is concerned with the pathophysiologic response of the dog to an induced unilateral lymphatic obstruction. This condition was attained by the most certain method available, i.e., surgical extirpation of the right carotid sheath and its contents, sparing the carotid arteries and the vagus nerve. After a convalescent period of six weeks, the right hemilarynx was injected with the radiogold and the lymphatic outflow from the supraglottic, cordal, and infraglottic areas followed by the same techniques as employed in the series of normal animals.

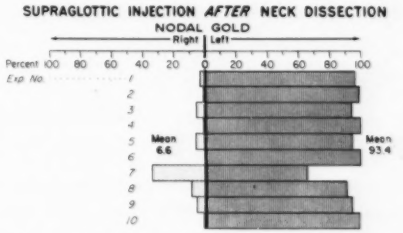

FIG. 5—Distribution of the nodal Au^{198} from the right supraglottic area of the dogs subjected to a right cervical lymphadenectomy.

Results

Supraglottic Area. Figure 5 shows the change in lymphatic flow which has been induced by a right cervical lymphadenectomy. Lymph flow as determined by this fractional study of the gold-bearing tissue has been reversed and drains to the

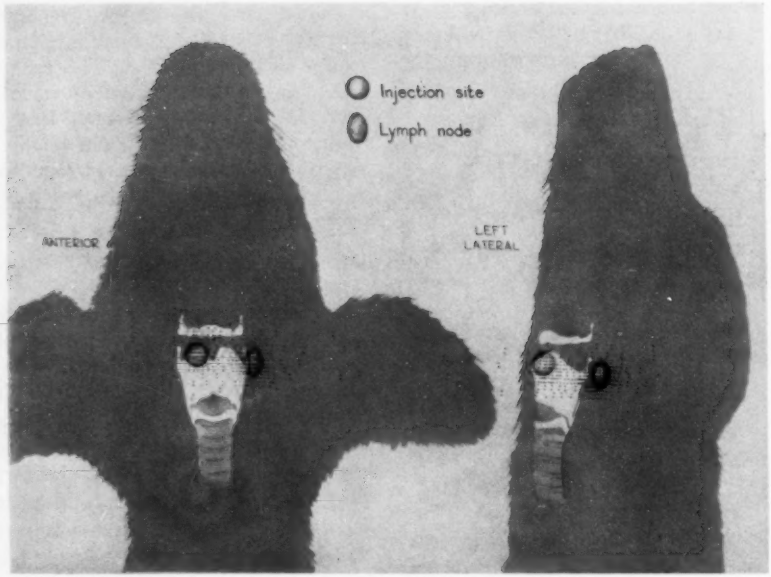

FIG. 6—Scintigram demonstrating the contralateral movement of Au^{198} from the right supraglottic area of a dog subjected to a right cervical lymphadenectomy.

contralateral deep cervical chain. The contralateral outflow is predominant in all of the animals with this series; it is exclusively contralateral in four; and bilateral in six, with the movement to the right ranging from 0 to 34.6 per cent.

The mean movement to the left is 93.4 per cent, and to the right is 6.6 per cent.

The scan taken of the neck shows unequivocal movement of radiogold to the left suprapharyngeal node (fig. 6).

Cordal Area. The direction of lymphatic flow from the right vocal cord in those animals devoid of the regional nodes is again to the left suprapharyngeal node. Figure 7 shows mean movement to the left jugular node of 89.1 per cent and homolateral movement of 10.9 per cent. The range of homolateral drainage was 0 to 25.0 per cent.

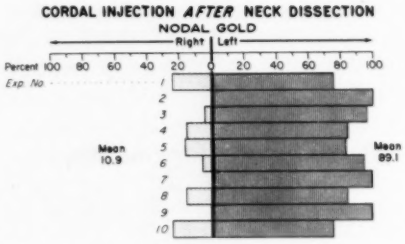

FIG. 7—Distribution of the nodal Au^{198} from the right cordal area of dogs subjected to a right cervical lymphadenectomy.

Infraglottic Area. Again the observation is made that lymphatic drainage from the larynx deprived of the regional nodes is primarily a contralateral occurrence (fig. 8). The mean movement to the left is 83.6 per cent and to the right 16.4 per cent. The range of movement to the right is 0 to 67.6 per cent.

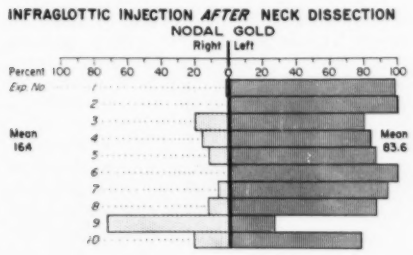

FIG. 8—Distribution of the nodal Au^{198} from the right infraglottic area of dogs subjected to a right cervical lymphadenectomy.

THIRD PHASE

The third and last part of this study was designed to determine the duration of this deviation in lymphatic outflow incurred by a unilateral cervical lymphadenectomy. Thirteen animals were subjected to the surgical procedure and were similarly tested after a period of sixteen weeks (fig. 9). No significant change in this induced variation was noted in this group as compared to those animals tested six weeks after the lymphadenectomy. The bar graph illustrates the findings in a series of thirteen animals. The mean homolateral movement of the radiogold was 7.6 per cent in this series.

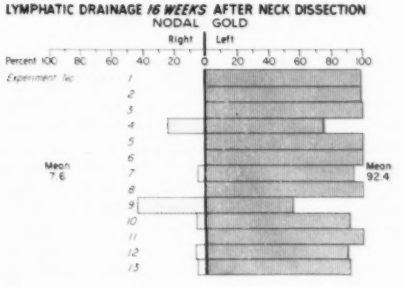

FIG. 9—Distribution of the extralaryngeal Au^{198} in the suprapharyngeal nodes of dogs subjected to a right cervical lymphadenectomy sixteen weeks prior to this analysis.

CONCLUSIONS

As a result of this research carried out on the canine larynx, the following conclusions are drawn:

1. A technique employing radiogold has been described to determine the lymphatic outflow from the larynx in qualitative and quantitative terms.

2. Lymphatic outflow from the three major areas of the normal larynx is predominantly a homolateral event. In this series, exclusively unilateral drainage occurred in 56.7 per cent of the animals, while the remaining 43.3 per cent manifested bilaterality of drainage. The range of contralateral movement of the gold was 0 to 46.8 per cent, with a mean of 4.4 per cent.

3. Surgical extirpation of the regional node produces a condition of lymphatic obstruction characterized by contralateral lymphatic drainage from each of the test sites. Thirty per cent of the animals manifested only contralateral lymph flow. The remaining 70 per cent demonstrated predominantly contralateral drainage with a lesser amount of the test material moving to the site previously operated upon. The range of homolateral movement in this series was 0 to 67.6 per cent, with a mean of 11.3 per cent.

4. There was no evidence of lymphatic regrowth in those animals examined by this technique sixteen weeks after the performance of a cervical lymphadenectomy.

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DISCUSSION

F. Johnson Putney, M.D., Philadelphia: The lymphatic pathways of the larynx and adjacent cervical lymph channels have been receiving more experimental and clinical attention during the past several years, and Drs. Louis and John Welsh and Dr. Behlke have given us more data on this somewhat neglected field, yet the physiology of the lymphatics remains unsolved.

It has been amply demonstrated that the lymphatics of the larynx are connected bilaterally, although drainage is predominantly unilateral. When alteration occurs in the lymphatic drainage from one side, either from trauma, surgical intervention or tumor blockage, the lymphatics form collateral paths similar to those of the vascular system with which they are closely related. The lymph sacs and blood vessels are in direct communication from their earliest appearance, but the connections with veins disappear, except those of the jugular sacs, which persist to form the termination of the thoracic and right lymphatic ducts. Thrombosis occurs in the lymphatic vessels and may destroy the lymphatic valves in a manner similar to that in the venous channels.

It is possible to inject lymphatics in a reverse direction in spite of the presence of valves. This is done by first ligating the main ducts, and it results in distention of the peripheral tributaries and incompetence of the delicate valves. In the dog, the tributary lymphatics join to form a single duct which runs down the side of the neck on the outer side of the carotid artery just below the angle of the jaw, and the essayists' findings could be amplified by retrograde injection of the tracer substance to determine whether there is any predilection for a given side after the material reaches the suprapharyngeal node.

This may provide a more accurate method of determining the relative degree of lymph drainage to each side, remove the chance of too forceful injection or incorrect choice of laryngeal site for injection, and eliminate the possibility of spill to the opposite side.

The importance of an accurate knowledge of the anatomic pathways for lymphatic spread from lesions of the larynx cannot be underestimated in cancer surgery. The bilateral drainage from the larynx and reversal of direction after obstruction requires further evaluation of lesions which are predominantly unilateral and do not involve the midline, and accounts for the occasional case of contralateral cervical metastasis.

From these anatomical experiments, the finding that supraglottic injections did not reach the opposite lymph channels as readily as cordal ones is contrary to the clinical impression that lesions of the cordal area are less likely to metastasize, either homolaterally or contralaterally, than supraglottic ones. Since surgery is not an exact science in the strictest sense of the word, flexibility must be preserved; with the new knowledge of anatomical lymph drainage, the insights and techniques need to be correlated to secure the best individual treatment for the patient.

One of the great unknowns is the biologic activity of the cancer, which may manifest itself in the rate of tumor growth, its ability to invade, the tendency to permeate lymphatics or blood vessels, and to form lymph node emboli either singly, in groups, or to more distant sites. The length of time that a malignant lesion has been present is hard to determine, but it may be assessed to some degree by the clinical findings. A bulky primary tumor in the larynx with no palpable nodes offers an excellent prognosis; whereas a short history of primary tumor with cervical node metastasis indicates high biologic activity, and the prognosis is less favorable.

The project presented has been excellently conceived and diligently performed, and I hope the authors will continue their interest in this subject.

WALTER H. MALONEY, M.D., Philadelphia: I was very pleased to be invited to discuss this paper formally.

As I looked over the statistics presented here, I was struck by the low incidence of contralateral spread in the supraglottic lesions. Our clinical experience has proved otherwise. In a search to find out why this might be so, I wonder if perhaps the particle size of the radioactive gold, 3 millimicrons, might be the factor which causes this discrepancy; for if we remember that the squamous carcinoma cell is much larger, this variation in the size of the experimental solution may not be applicable.

The quantitative study and the mean values which the authors presented raise in my mind a question as to whether a seeding of just a few cells will cause a metastasis. Does it matter how much goes to one side? We know very little about body defense mechanisms and the immunological response, and perhaps it does not matter if a few cells spill over, as the authors so aptly put it.

I would be interested in knowing how soon the increased flow goes to the contralateral side of radical neck dissection; whether this should change our management at the operating table when we do a laryngectomy and neck dissection; and whether, without exception, we should cut off the contralateral lymphatic spread before we manipulate the tumor during a neck dissection.

We should also remember the peripheral venous distribution of cancer cells as they are thrown off from the original tumor.

I wonder if blockage of the homolateral nodes in a metastatic carcinoma of the larynx will increase the flow to the opposite side and, if so, when this happens. Are these channels of bilateral or contralateral drainage present all the time, depending on a pressure gradient, or is there still some unknown factor which brings them into being before they become patent?

To the authors I would say that the studies you have presented are important. The rapidly expanding tendency to do laryngectomy and neck dissection for almost all types of lesions relieves one of the responsibility for careful inspection and decision as to operation. There always has been and always will be a need to concern ourselves with the conservation of function. We should base our own operations on well founded anatomical principles, which in turn are laid down by application of knowledge brought to us by studies such as this.

DR. JOHN J. WELSH: We would like to thank Doctors Putney and Maloney for their critical review and discussion of this paper. They both presented a number of problems that are not readily explainable on the basis of our data. That greater contralateral drainage occurs from the cordal area than from the supraglottic area, as noted by Doctor Putney, is a surprising observation.

We are reluctant to draw an immediate clinical application from these observations because of the greater complexity of the lymphatic system in man. However, we are continuing this investigation and have used this technique in four human cases without difficulty. While the results to date have been unrewarding, we are hopeful that clinical value will be eventually realized.

PLEOPTICS

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IT was at Moorfields Hospital in London and at the Clinic of Professor Böck in Vienna in the summer of 1957 that I first met the people engaged in the treatment of amblyopia by methods developed in Switzerland and in Germany.[1,2] I was immediately impressed by both the theories and the results which these apostles of new tidings presented to me. I was just as much impressed by the variety and the complexity of some of the instruments needed to perform the different manipulations which are part of the diagnostic and therapeutic procedure. In fact, the orthoptic department at the clinic in Vienna, with all the flashing and ringing instruments devised by Professor Bangerter, looked almost like a well equipped kindergarten. I was especially intrigued by the fact that a special ophthalmoscope with a formidable battery of lenses and other accessories was needed to perform a single and seemingly simple task—the projection of the image of a star on the patient's fovea. Moreover, another no less complex ophthalmoscope, with two batteries of lenses rather than one, was needed to produce a doughnut-shaped retinal stimulus pattern.

Coming back home I decided to investigate whether or not these ophthalmoscopes were really necessary to achieve the results I heard claimed in Europe. I had the impression that what is good and new in them could easily be incorporated into our standard ophthalmoscopes. I felt that this promising new method could become much more popular if the acquisition of new and expensive instruments were not necessary.

First of all, of course, it was necessary to analyze those instruments for their performance and their distinguishing features. This was an interesting endeavor, since it led me to recapitulate in my own mind some of the structural essentials of the ophthalmoscope.

Although we have all used ophthalmoscopes ever since our first exposure to ophthalmology, few of us have given thought to their construction. One of the purposes of this lecture is to clarify certain relevant points. I shall not deal with the principles of ophthalmoscopy as such or with the optics of the ophthalmoscope, only with the battery of lenses which nowadays are attached to all except the most primitive ophthalmoscopes.

There is therefore no need to go back as far as the invention of the ophthalmoscope—although it was not long before lenses were attached to ophthalmoscopes (a) for better visualization of the examined eyeground and (b) as a device to measure the patient's refraction. This latter aspect fascinated ophthalmologists of the last century. Helmholtz in his original publication (1851) about the eye speculum, as he called it, mentioned that estimation of the refractive error would be possible by using his instrument. Rekoss invented his disc and the battery of lenses used in connection

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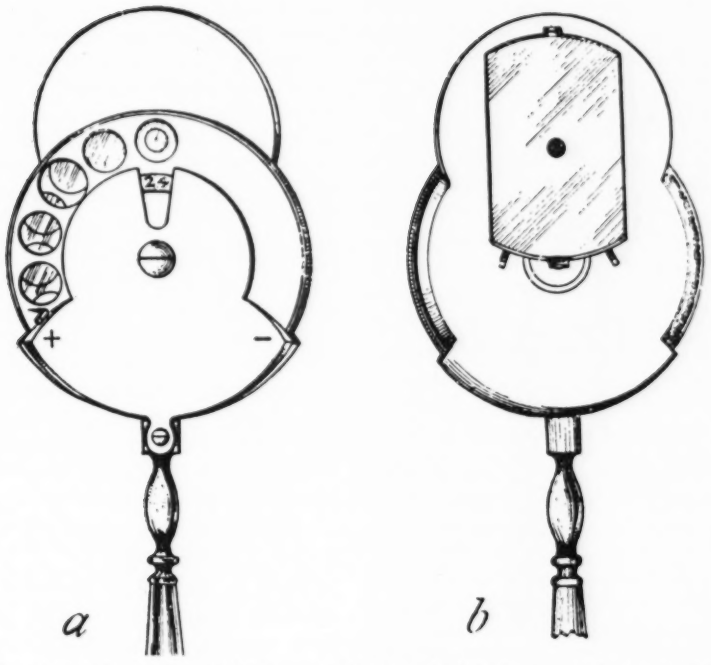

FIG. 1—The Loring Reflecting Ophthalmoscope, (a) The *back* of the instrument, showing the Rekoss Disc. (b) The *front* of the instrument with reflecting mirror and sight hole. (Slightly modified from Loring, 1870.)

with the ophthalmoscope one year later (1852); and Mauthner in his famous monograph on ophthalmoscopy (1868) devoted considerable space to the subject of refraction with the help of the ophthalmoscope.[8] I still remember my own student years in Budapest, Hungary, watching the chief, Julius Fejér, as he prescribed eyeglasses by finding the lens which in direct ophthalmoscopy permitted him to see the fundus best, with a keratometer reading as the only other added information. He used a reflecting ophthalmoscope similar to the one described by Loring[6] (1869-70) with a battery of lenses in the familiar Rekoss disc behind the circular opening in the concave mirror (fig. 1). To mention that the battery of lenses was behind the sight hole of the mirror would seem almost unnecessary were it not for the special emphasis I want to place on this detail at this moment. Where else, one will ask, *should* the battery of lenses be? In an illustration of an even older instrument (fig. 2) devised by Edward von Jaeger of Vienna in 1854, one can see that already in the earliest ophthalmoscopes with provision for lens attachment, the place of the lens was *behind* the reflecting mirror. The arrangement has been retained in all later types of reflecting ophthalmoscopes; in fact, it has been retained in the electric ophthalmoscope.

Figure 3 shows an old-type concave mirror ophthalmoscope in diagrammatic fashion. The reflecting mirror collects

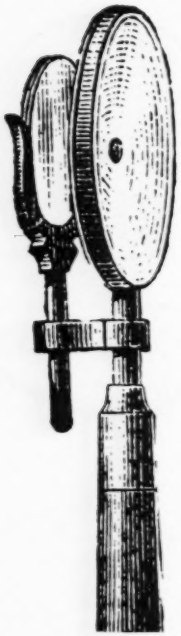

FIG. 2—The Jaeger Reflecting Ophthalmoscope. The removable lens is behind the sight hole of the concave mirror. (From Mauthner's "Lehrbuch der Ophthalmoscopie," 1868.[8])

the diverging rays from some appropriate light source and throws them into the patient's eye. These rays illuminate the fundus after being further refracted by the patient's cornea and lens. As far as illumination is concerned, the refractive or accommodative status of the patient's eye does not matter. The illumination is diffuse. From an optical point of view the entering light does one thing only: it makes details of the eyeground secondary sources of light. From these details, rays pass through the patient's lens and cornea, through the opening in the mirror (usually also through a lens behind the sight hole of the mirror) and, finally, enter the examiner's eye. Our diagram depicts the ideal case in which both the patient and the examiner are emmetropic and rest their accommodation. There is therefore no lens interposed in the path of the rays (indicated by broken lines) which, starting from a point on the patient's fundus, finally come to sharp focus on the examiner's retina.

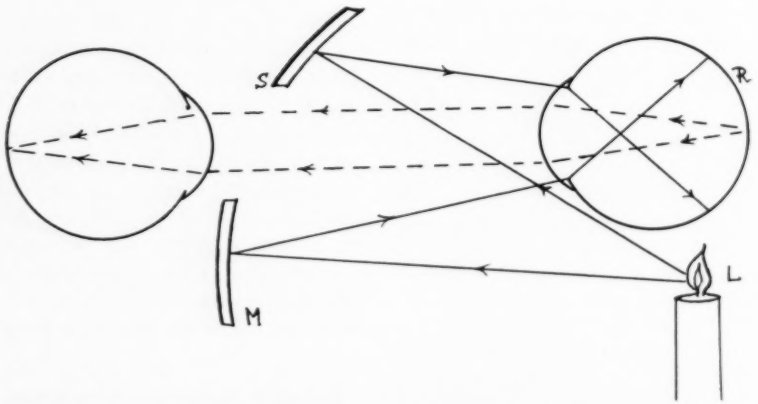

FIG. 3—The Ruete Concave Mirror Ophthalmoscope for direct examination of the fundus of an emmetropic patient by an emmetropic observer. (L) light source; (M) mirror; (S) sight hole; (R) examined retina.

In figure 4 a diagram of an ordinary electric ophthalmoscope, all this is shown in somewhat more detail. This diagram is quite schematic, as are all the following ones. (For the purpose of easier visualization I have separated the path of the returning rays from the path of the rays entering the examined eye in figures 4, 5 and 6.) It should be obvious from the diagram that the illuminating optical system, consisting of a condensing lens and, in this example, a plane mirror, has nothing to do with the battery of lenses behind the sight hole. These lenses cannot therefore modify the vergence of the rays that enter the eye. They affect the emergent rays only. In our diagram, these emergent rays are drawn as converging; they are coming, as it were, from a myopic eye somewhere to the right. The minus lens placed in the back of the sight hole makes these emergent rays parallel. Thus, they have the most advantageous vergence before entering into an emmetropic examiner's eye. Obviously, an emmetropic (and nonaccommodating) examiner will best see the details of the fundus of a patient who happens to be myopic if an appropriate minus lens is placed somewhere — let me emphasize, anywhere — in the path of the returning rays. If he cares to determine his patient's refraction by this method, the lens, which in our diagram is placed behind the sight hole, will furnish the desired information.

Even if the whole literature about the construction of ophthalmoscopes is not available to me, I can confidently state that ophthalmoscopes are *generally* so constructed that the battery of lenses is placed behind the reflecting mirror (or in the case of the May-type ophthalmoscope with a totally reflecting prism, behind the prism). This seems by now almost natural to us. It could as well, of course, be placed in front of it. To have placed the lens battery in front, into the path of the illuminating system, is the supposedly great and distinguishing innovation offered in an instrument called the Visuskop; in fact, for this very reason its manufacturers claim superiority for this instrument as a clinical refractive device. It is the only ophthalmoscope known to me in which this arrangement is offered. It makes the Visuskop a distinct, a unique instrument, and if Mayweg and Massie (1958) stated that the Visuskop is "essentially a conventional ophthalmoscope with low illumination," one will feel the need to contradict. The Visuskop is not a conventional ophthalmoscope (fig. 5).

Of course the superiority of this arrangement for refraction purposes is mostly an imagined one. An examiner, if he really cares to determine refractive error by the primitive and long outdated technique of looking at fundus details and adjusting lenses until he sees those details sharply, can just as well work with his old ophthalmoscope with the lens battery behind and not in front of the reflecting mirror. The information gathered by the examiner derives solely from the rays returning from the examined eyeground. How these rays got there does not, in the least, matter. The placement of the battery of lenses is irrelevant. Even the formidable array of lenses, arranged in one-half-diopter steps from + 25 to — 24 diopters, will only impress those who know little about clinical refraction. Half-diopter steps are unnecessary, as the method is not that accurate. Moreover, the method by which one has to ascertain the power of the lens through which one is looking is too complicated. I for one cannot help being constantly annoyed by the lens arrangement in the Visuskop.

Matters are different if one wants to examine not so much the details of

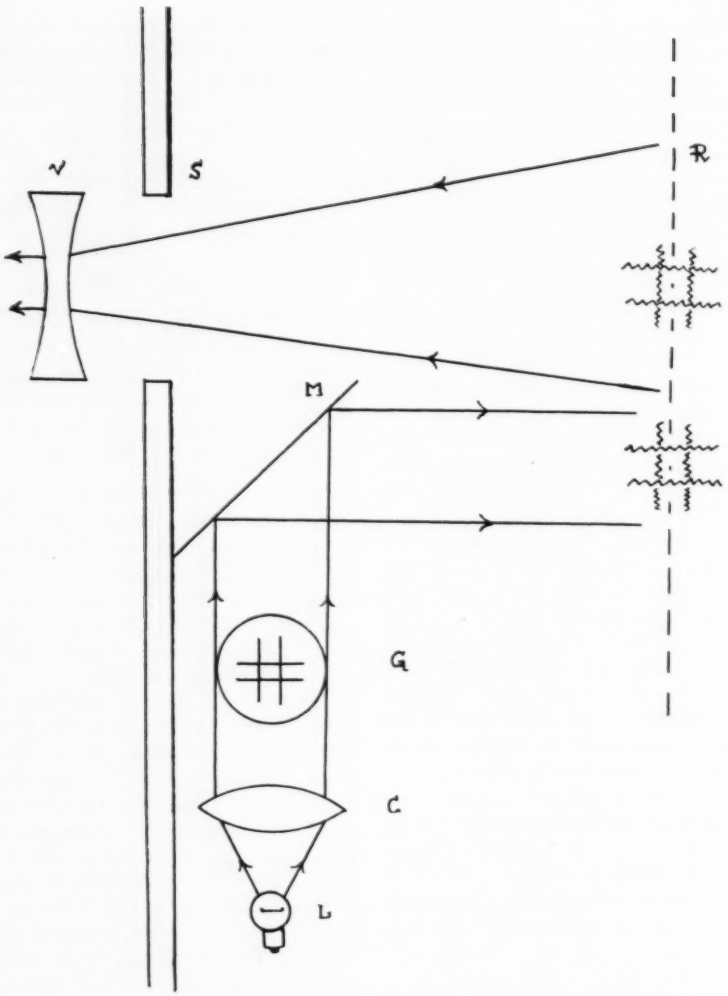

FIG. 4—Diagram of conventional electric ophthalmoscope. (L) light source; (C) condensing lens; (G) graticule for measurement of eyeground details; (M) plane mirror; (S) sight hole above and behind reflecting mirror; (V) viewing lens behind sight hole; (R) retina. The mirror projects an unsharp image of the graticule upon the retina of an eye assumed to be myopic. Though observer looks at this image through appropriate minus lens, he sees an unsharp graticule image.

the patient's eyeground as the details of some pattern, like a star, projected upon it, the reason which prompted many of us to buy a Visuskop. In this case it is of undoubted advantage if one has the means to project a reasonably sharp image, and one way to project a sharp image upon the examined retina is by the inverted arrangement of lens battery and mirror one finds in the Visuskop.

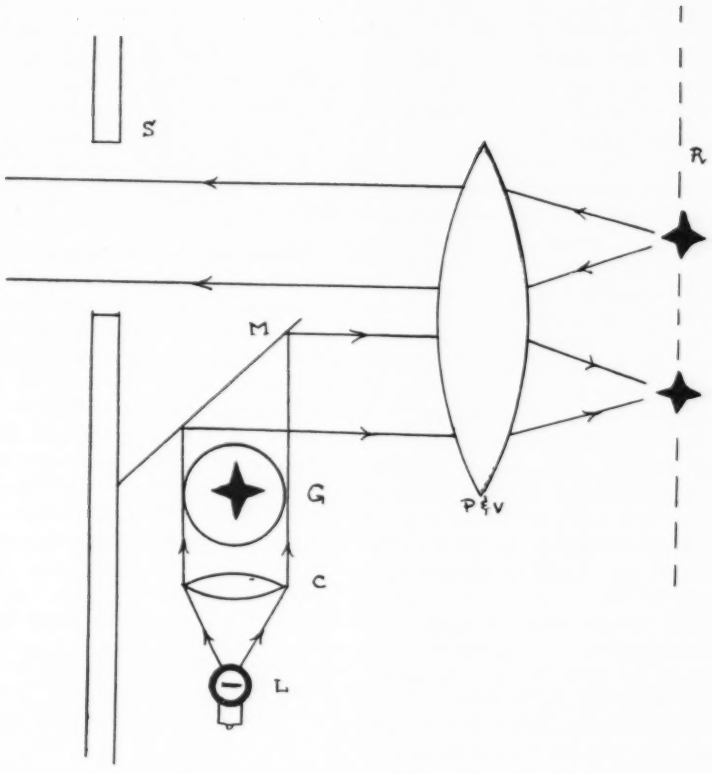

FIG. 5—Diagram of Visuskop. (L) light source; (C) condensing lens; (G) graticule for star test; (M) plane mirror; (P and V) projection and viewing lens in front of mirror; (S) sight hole behind mirror; (R) retina. The mirror projects a sharp image of the graticule upon the retina of an eye assumed to be hypermetropic through appropriate convex lens. Emmetropic observer looks at this sharp image through same lens.

Patterns for projection upon the eye-ground were suggested by many and are incorporated into several ophthalmoscopes. The first arrangement by which this problem was, to my knowledge, successfully solved was that made by Morgan, who described his well-known retinal graticule adapted to a regular ophthalmoscope in 1927.[9] I use the word "regular" merely to indicate that in Morgan's arrangement the lens battery also occupied the conventional position behind the sight hole. The purpose of the projection of these patterns usually was to help measure such things as the size of retinal details, the width of blood vessels, and the extension of lesions. Some ophthalmoscopes (the Visuskop is one of them) contain an astigmatic dial to be projected upon the retina. I doubt whether anyone has ever determined astigmatism correctly in this manner. The most important projectable pattern in the Visuskop, the one which makes it an instrument of interest to us at the moment, is the small star in

an otherwise empty field or surrounded by a set of concentric circles. The projection of this pattern upon the examined retina is one of the most important steps in the pleoptic evaluation of an amblyopic patient.

Strangely, even the measuring graticules gained only limited acceptance by our profession, though the importance of securing such data as those just mentioned is beyond question. Such projectable measuring graticules should be available in one's ophthalmoscope. There are such graticules in the Visuskop. Their usefulness is certainly enhanced if a sharp image of them can be projected upon the examined fundus details. With most conventional ophthalmoscopes this cannot be done. Morgan achieved it in a way I shall discuss presently. In the Visuskop the problem is solved by the positioning of the lens battery in the manner I have just indicated, since this arrangement permits the placement of the patient's refractive correction into the path of the rays which *enter* the examined eye. However, this advantage, at least as far as the star test in pleoptics is concerned, could be equally well served by a less complete set of lenses. First of all, I found that an error of at least + 1.5 or — 1.5 diopters has to be introduced before either I or the patient sees the star significantly less sharp. I tried to be both, the observed onto whose retina the star was projected and the observer who looked for the star on someone else's retina, and I found this limitation of accuracy in both cases. The one-half diopter steps are therefore unnecessary. Secondly, I have never yet subjected to pleoptic analysis a patient with a refractive error of over 6 or 7 diopters of myopia. The high power lenses are wasted on a pleoptic instrument.

Figure 4 shows in a diagrammatic fashion that it is, in fact, impossible to project the sharp image of a graticule upon a patient's eyeground with a regular ophthalmoscope if the eye is, say, myopic. The image of the graticule on this eyeground will be unsharp, and even if the examiner looks through the proper correcting minus lens placed behind the sight hole, he will see only that unsharp image.

Figure 5 shows the superiority of the Visuskop arrangement on the example of a hyperopic patient and emmetropic observer. The plus lens placed *in front* of the mirror allows a sharp image of any graticule to be projected on the patient's retina (it makes the rays converge before they enter the patient's eye), and the same lens permits the emmetropic or well corrected observer to see this pattern in sharp outline. If we use the star graticule recommended for pleoptics, both the patient and the examiner see the star in sharp outline. (I have drawn the lens sufficiently large to make it clear that both the rays which enter the examined eye and the rays which leave it pass through the same lens. And I want to emphasize again that the two sets of rays, the entering and the emerging rays, are not in reality separated from each other. They pass through the same part of the interposed lens. The separation in the diagram serves only didactic purposes.)*

The fact that one *can* project a sharp star image upon the amblyopic patient's retina is a matter of great importance, and one can do it well with the Visuskop. The question is: Does one need a separate ophthalmoscope for this purpose? Many of the experts in Europe

*Using a regular ophthalmoscope, it has always been my habit not to wear my refractive correction; I simply deduct its value if I want to get an approximation of the examined eye's refraction. Using the Visuskop for the projection of the star, I must wear glasses or a specially made ocular, since the lens battery in its special position permits neutralization of the examined patient's refractive error only.

don't seem to think so. Professor Bangerter,[1] to whom we must all be grateful for his introduction of the test to determine the mode of fixation in amblyopia, still uses his simple original green filter with a small perforation to serve as fixation object. Mackensen[7] in his interesting studies of the behavior of fixation in amblyopia relied on a similar method. Ehrich[3] uses a Comberg ophthalmoscope with a variable diaphragm made for this purpose. Evans[4] and Haensel[5] use conventional ophthalmoscopes with interchangeable diaphragms in various sizes. Steiger and Würth[11] and von Noorden and Burian[10] use a fundus camera. I have now for a year and a half used a Morgan graticule with a small star or ring replacing the usual reticulated pattern.

Thus, one certainly need not use a Visuskop to ascertain the locus of fixation in the amblyopic eye, but if one is available, it can be put to good use. After becoming accustomed to the annoying and confusing manner in which the dioptric value of the projecting lens is ascertained, the ophthalmologist should be able to use the instrument with great ease. Both the patient and the examiner will see a sharply outlined star without any difficulty.

There was another disquieting point in this matter of pleoptic instrumentation which bothered me from the beginning. The ophthalmoscope one supposedly had to acquire for the purpose of throwing a star figure upon the patient's retina did not have sufficient light intensity to project that other important pattern upon the patient's retina — the "afterimage doughnut," as I got used to calling it: the Cüppers pattern, as it should be properly called. The afterimage graticule, next to the star graticule, is the most important piece of equipment in all of pleoptics, and for its invention Professor Cüppers deserves our gratitude and admiration. For the purpose of projecting this pattern the manufacturer built another ophthalmoscope of greater light intensity, the Euthyskop. The Euthyskop could have easily been equipped with a star graticule. It would have been so easy and simple to decrease the light intensity in this instrument to the low level desirable for the star test. The simple addition of one graticule would have made necessary the acquisition of but one ophthalmoscope for the purposes of pleoptics. The manufacturer has not done this. In fact, the Euthyskop was equipped with polarizing filters (not needed in pleoptics) and the same formidable lens battery, redundant (as I tried to show) even in a refracting ophthalmoscope. They are certainly more so in an instrument avowedly built for the purposes of orthoptics-pleoptics. (Even the name of the instrument suggests this very purpose.) Moreover, as an inspection of the instrument will immediately reveal, the lens battery which is such a distinguishing feature of the Visuskop has been shifted back in the Euthyskop into the conventional position, *behind* the reflecting mirror. I was amazed when I discovered this and have not yet come to understand why this had been done. The unorthodox placement of the lens battery is, in my estimation, the distinguishing feature of the Visuskop, its very *raison d'être*. As I have just tried to demonstrate, it is this very feature which makes possible the projection of sharply outlined patterns upon an eyeground in a manner which, if not superior to Morgan's solution with movable graticules, is certainly its equal. One could have expected that the same arrangement would be retained in the other ophthalmoscope devised for projection purposes.

I finally discovered that the arrangement *was*, after all, retained, but only

in a rudimentary fashion. The Euthyskop possesses a unique feature in that it contains two separate batteries of lenses; the formidable Visuskop battery of lenses from + 25 to — 24 diopters in one-half-diopter steps arranged in the conventional position, and another one with a rather poor sampling of lenses in front of the reflecting mirror. If I could not help having the impression that there are too many lenses in the first battery (which in this instance serves for viewing purposes only), there is the feeling that in the second frontally positioned lens battery (which in this instance is a part of the illuminating and projecting system only) there are not enough lenses. They follow each other first in 5 diopter steps, then in 10! I would surely much rather have a + 2.5 and — 2.5 than a + 20 and — 20 diopter lens in my pleoptic instrument.

The fact that one can produce a rather conspicuous afterimage even with such a poor projection system probably means that a sharp outline of the projected Cüppers pattern on the treated retina is not essential. In that case one does not need a Euthyskop to project it. My feeling is that, even if not essential, sharpness of outline is of some significance. I therefore had to conclude that the Euthyskop is a rather poor instrument to evoke the desired afterimage.

While I believe that the Euthyskop is unnecessarily complicated and would in fact be a better instrument had it retained the lens arrangement which distinguishes the Visuskop, I must confess that it represents a remarkable piece of optical engineering. The illuminating and projecting system is eccentrically placed (somewhat like the prism in the May ophthalmoscope). In this manner light is projected upon the eyeground through lenses of the front lens battery, but it returns into the eye of the examiner through the other, conventionally located, or back, lens system. I mention this especially, since I could not indicate this feature in my rather diagrammatic representation of the optics of the Euthyskop (fig. 6). The examined or treated eye is assumed to be myopic in the case illustrated in this diagram, and a minus lens of the projecting lens battery (at the lower right side of the diagram) projects an appropriately diverging bundle of rays into the eye (farther to the right and not shown) to form a sharp image on its retina—as sharp, at least, as the existing choice of lenses permits. This lens has to be preset. One cannot change it during the examination. The rays that leave the eye (shown in the upper half of the diagram) leave this myopic eye in the form of a converging bundle and are made parallel by an appropriate minus lens of the conventional lens battery behind the sight hole (at the upper left of the diagram). The projected pattern cannot be influenced by turning the gear wheel of the viewing lens battery, while, obviously, the examiner may neutralize his own refractive error by selecting a proper lens.

With all these features built into the Euthyskop, the instrument is much too heavy and clumsy and its various knobs and wheels cannot be turned while using it without moving, or at least shaking, it. This, to a certain extent, defeats the very purpose of the instrument, making it extremely difficult to center the hollow of the ring-shaped pattern upon the treated fovea. In the case of the Visuskop I only asked the question whether or not it is essential to acquire this instrument for pleoptics. I emphasized, however, that it fulfills its part in the pleoptic procedure supremely well. The question raised in connection with this second instrument is a different one: Is the Euthyskop a suitable instrument to

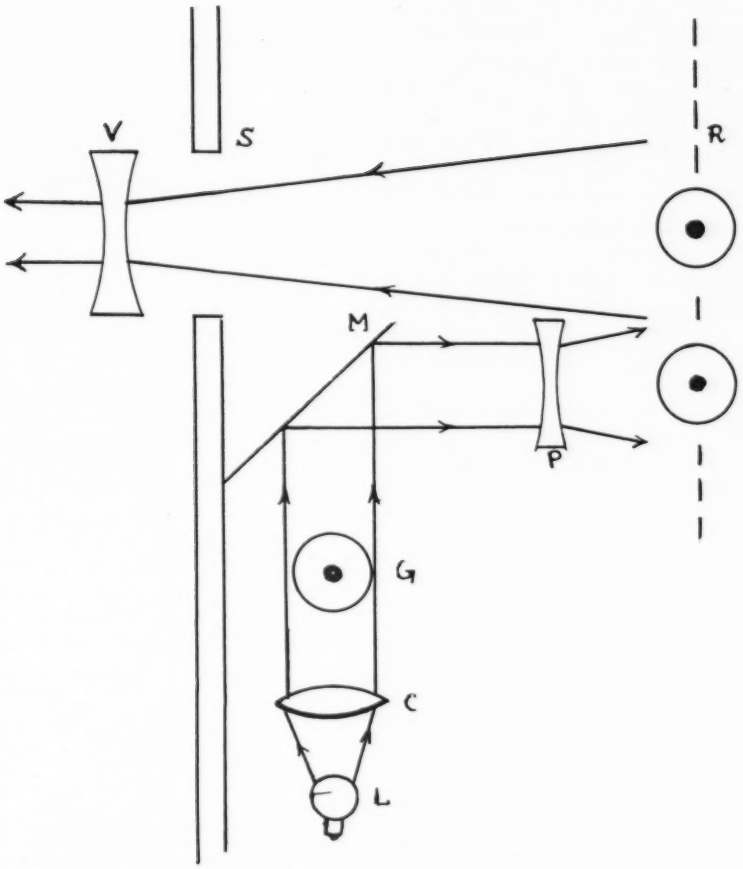

FIG. 6—Diagram of Euthyskop. (L) light source; (C) condensing lens; (G) graticule to project Cüppers' "doughnut" pattern upon retina; (M) plane mirror; (P) projection lens in front of mirror; (S) sight hole behind mirror and projecting lens; (V) viewing lens behind sight hole; (R) retina. The mirror projects a sharp image of the graticule upon the retina of an eye assumed to be myopic through the appropriate concave projection lens. Emmetropic observer sees this sharp image through the appropriate concave viewing lens.

carry out Cüppers' intentions? One cannot say "No," but there is room for improvement.

The problem of projecting the sharp image of some pattern upon the examined retina is an old one and, as I have mentioned, it has long been solved satisfactorily by Morgan[9] and others. Pleoptic instrumentation brought the problem once more to the fore. It is not necessary for this purpose to change the time-honored arrangement of mirror and lens battery. All that is necessary is to make either the light source of an electric ophthalmoscope or the condensing lens movable. This will provide for the desired change in the vergence of the rays thrown into the examined eye. One can see from figure 7 that moving the condensing lens of the illuminating system upward from the

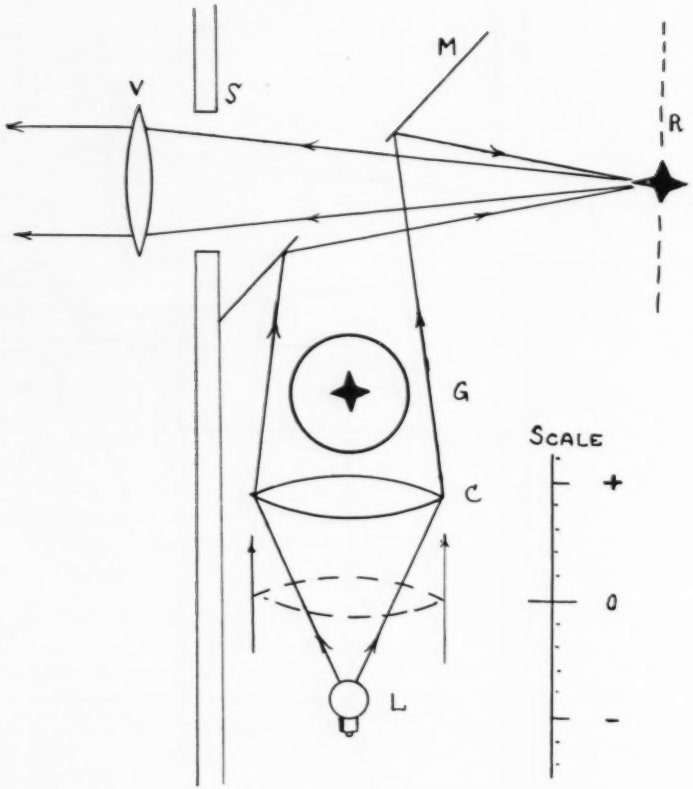

FIG. 7—Diagram of Measuring Ophthalmoscope with movable condensing lens and graticule (Morgan's arrangement). (L) light source; (C) movable condensing lens; (G) graticule for star test; (M) plane mirror with perforation; (S) sight hole behind perforation; (V) viewing lens behind sight hole; (R) retina. The mirror projects a sharp image of graticule with help of movable condensing lens upon retina of eye assumed to be hypermetropic. Emmetropic observer looks at sharp image of graticule through appropriate convex viewing lens in conventional position.

position indicated by the dotted outline into the position marked by the full outline makes the illuminating rays converge before hitting the mirror and before entering the examined eye. Of course, the same could be achieved by moving the light bulb downward. If the examined eye is hyperopic to an appropriate degree, these converging rays will fall in sharp focus upon the retina. (Opposite displacement of lens or light bulb will achieve sharp focusing in myopia.) A properly placed scale would enable the ophthalmologist actually to read off the patient's refractive correction, should it be so desired. I have indicated such a scale next to the movable lens. Rays reflected by the illuminated eyeground will leave the eye with negative (or positive) vergence, and an appropriate plus (or minus) lens will be needed to make them parallel before they enter the examiner's

eye. One can naturally place any graticule, like the star or the ring-shaped pattern of Cüppers, in the path of the illuminating rays, and thus project a sharp image of it upon the observed retina.

Unfortunately this cannot be done with every electric ophthalmoscope. In some of them the illuminating system is rigid; neither the lamp nor the collimating lens is movable. There is some limited movability to the illuminating system in the De Zengg Giantscope. There are also some movable semaphores provided, at least in the older types of instruments, into which any graticule or pattern could easily be fitted. More than two years ago I suggested to the company that manufactures it, that small but appropriate changes be made on their Giantscope. However, their market research indicated that pleoptics is not an item worth the attention of a giant American company. I am sure that time will prove them wrong. Pleoptics, I feel, is here to stay, and only improved methods to prevent amblyopia will make it superfluous.

In some ophthalmoscopes, the light bulb is in a removable housing which slides into place. We have been accustomed to tightening the housing in one prescribed position. With some small effort it usually becomes possible to loosen this adjustment; in that case, one can, at will, change the vergence of rays entering the examined eye. Changing the vergence of the illuminating beam can easily be accomplished with most retinoscopes. In fact, this is a built-in feature in good streak retinoscopes, in which the pulling and pushing of a knob upward and downward serves this very purpose.

An added problem exists, of course, in the case of such improvisations. One has to design patterns for projection and then put these patterns into some appropriate place. I have tried this with several ophthalmoscopes. The filters now provided on most better ophthalmoscopes can quite easily be replaced with a small plastic disc with the required pattern on it. One of the filters, preferably the green filter, can be used to enhance retinal contrast. The perforated metal cap covering the light bulb can be modified in some other models. As I mentioned earlier, Professor Bangerter and several German pleoptists still use similar arrangements and don't ever bother with focusing.

These improvisations will, however, only produce suitable targets for the fixation test. One cannot produce a good afterimage with most of them, first of all because most ordinary ophthalmoscopes lack sufficient intensity of illumination.

Fortunately, I had one ophthalmoscope among the many I use available for experimentation; this instrument has been my choice and favorite in my daily work for several years—the measuring ophthalmoscope of Keeler, the ophthalmoscope for which the Morgan graticule was originally designed. All the features needed for pleoptic diagnosis and treatment are readily incorporated into this instrument without any changes on the instrument itself. All one has to do is to replace the Morgan graticule by other appropriate patterns. The illumination is more than adequate and it is variable. A great disadvantage is the intensive heat the instrument generates when providing high degrees of retinal illumination, and it also is too heavy. It is a regular ophthalmoscope with the lens battery behind the sight hole. Of course, one can measure refraction with it if desired. A sharp image of any of a selection of patterns can be projected upon a patient's retina, as described by Morgan:[9]

> In order to focus the image of the graticule on the retina, the retinal vessels are first clearly focussed with the ophthalmoscope, and then the focussing lens is moved up and down until the lines of the square [the particular graticule Morgan described] are seen in perfect definition.

One can reduce retinal illumination and perform the star test, or increase illumination and produce an afterimage. The focusing can be done without jerking the instrument and while looking uninterruptedly at the fundus.

As my analysis so far suggests, the determination of the locus of fixation in the examined retina can easily and satisfactorily be done with either the Visuskop or the movable graticule. The test can be conducted satisfactorily with almost any ophthalmoscope and with some retinoscopes in the manner originally described by Bangerter. The same is true of some other modifications suggested by different authors and also in this paper. On the other hand, the equipment for production of the ring-shaped afterimage is yet far from being satisfactory. With the Euthyskop considerable difficulties arise. The green filter must be used first to find the patient's fovea. Then the Cüppers pattern is inserted, using a corrugated wheel for the turning. This is not easy, and it shakes the whole instrument.

With the movable graticule the focusing can be done more accurately and more smoothly, and a really sharp ring of illumination can be produced around the fovea. Here again, however, there are some difficulties. Originally I started with a green filter inserted into the path of the illuminating beam (as is suggested for the Euthyskop), and then I slipped the filter out of place once I had located the fovea. But in this case my ophthalmoscope was also shaking and I could not be sure that the pattern had not been displaced. Lately, I have not been using the filter, but I start with low illumination while I am trying to place the bright ring as accurately as possible around the fovea. Then the light must be stepped up to produce an afterimage. If no assistant is available to turn the regulator knob on the transformer, the examiner has to do the turning himself without looking at the knob. Meanwhile, he has to keep his eye and the instrument motionless. This is not easy.

Furthermore, with both instruments, the Euthyskop and the Measuring Ophthalmoscope, a long time, nearly one half minute, is necessary to impress a fairly durable afterimage. And this is not easy on any patient. It is almost too much to expect a child to fixate some light (or whatever target the examiner found useful) with the sound eye while the examiner keeps on shining a strong light from a bulky, almost frighteningly close, instrument into the treated eye.

All these might appear small and insignificant details to those not engaged in this work and hardly worth discussion. But I feel that all these points should be mentioned. Pleoptics is one of those therapeutic methods in which equipment and procedure are of the essence. A great new method should not fall into disrepute due to poor attention to the details of execution.

Every one, I am sure, who has tried to impress the Cüppers afterimage upon its proper place around a patient's fovea must have had the idea of wanting to produce the afterimage by some momentary flash of light. About a year and a half ago I mentioned this to my friend Dr. Peter Halberg. He is, among many things, an expert on photographic equipment, and it was easy for him to mount the afterimage pattern into an electronic flash gun. We planned to present this modification as a new instrument at last year's meeting of this Academy but then

abstained from doing so after we had learned that others, too, had already had the idea and that, in fact, a modified Euthyskop with electronic flash arrangement was ready for production. This modification, when commercially available, will constitute a great improvement.

In the meantime I experimented with another modification of my set-up. As I have already mentioned, I found that working with either the Euthyskop or the Measuring Ophthalmoscope was detrimental to accuracy if there was anything to move by hand while I was looking through either instrument at a patient's fovea. I had the idea of changing the power of illumination in the ophthalmoscope with a footswitch. Such an arrangement is no novelty either. A footswitch can easily be connected to the transformer of current. Turning the regulator knob manually to an appropriately low number, I now have sufficient retinal illumination for the star test with the fixation graticule and also for the finding of the fovea with the Cüppers graticule. Once I locate the fovea, I pedal the light to the highest practical illumination level for 20 to 30 seconds. This, however, I shall consider only a temporary measure. The electronic flash arrangement will, I am sure, still be better.

SUMMARY

An analysis of the optics of the two special ophthalmoscopes suggested for pleoptic examination and treatment turned out to be rather fruitful and interesting. It led to a re-analysis of certain optical principles relative to ophthalmoscopy, especially the optics of projected graticules.

The fixation test, for which one of the new ophthalmoscopes is recommended, can be equally well conducted with some other available ophthalmoscopes and nearly equally well with almost any ophthalmoscope, provided one does not mind improvising some small modifications.

The Cüppers afterimage must be produced with special instrumentation. Either with the second of the two newly recommended ophthalmoscopes or with an ophthalmoscope which (a) provides a sufficiently high degree of retinal illumination and (b) permits the sharp focusing of a special graticule upon the treated fovea. Some modifications on this equipment are suggested. These modifications should make it easier to perform this important procedure more efficiently and more accurately than was heretofore possible.

Pleoptics is a new and very promising method of treating amblyopia. Strict adherence to details of the diagnostic and therapeutic procedure is essential for good results.

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DISCUSSION

HERMANN M. BURIAN, M.D., Iowa City: We have just heard what I believe to be an enlightening and enjoyable paper. Having become interested in pleoptics, Dr. Linksz, with the thoroughness so characteristic of him, started at the very beginning, with the optics of two instruments recommended for use in the diagnosis and treatment of the fixation pattern in amblyopia. In telling us what he has learned about it, he has at the same time reminded us of the workings of one of our commonest tools, the ophthalmoscope, which we take too much for granted.

I am sure that all of us who are concerned with pleoptics are grateful to Dr. Linksz for clarifying the optics of the Visuskop and the Euthyskop. But he has also pointed to some practical difficulties in the use of these instruments, especially in the use of the Euthyskop. It is indeed difficult to manipulate this instrument without moving it, and clearly this defeats its purpose. There is little sense in expending much ingenuity on an optical system to produce a sharp afterimage if the image moves all around on the retina. The electronic flash method undoubtedly will be helpful in remedying this difficulty to some extent. I wonder what Dr. Linksz would think of a more rigid arrangement in which the head of the patient would be held in a headrest and the Euthyskop fixed in some manner by a movable bar, making the unsupported holding of the instrument unnecessary and consequently avoiding its shaking. Also, I should like to ask Dr. Linksz how he provides for fixation by the sound eye during the Euthyskop treatment. I consider this to be a rather important item. The methods we have tried thus far have not been entirely satisfactory. Both the steady position of the head and the fixing by the sound eye are very well accomplished in the Pleoptophor of Bangerter. I am aware that this instrument is built with a therapeutic principle in mind which differs from that which the Euthyskop proposes to serve. But again, wouldn't slight modifications permit its use in the afterimage type of treatment as well.

DR. LINKSZ: I am grateful to Dr. Burian for his laudatory discussion; I am not so sure that I deserve it. There was no time to speak about many of the technical aspects of the problem. Pleoptics is a method in which instrumentation and technique are of the essence. It cannot be done if it is done sloppily.

There was no reason for me to mention the Pleoptophor. Only one "who has everything" can afford to have this instrument in his office. My purpose was to show that much can be achieved without special and expensive instruments. Some of the problems Dr. Burian mentioned were solved by Dr. Bruno Priestly. I have seen his arrangement, which he jokingly calls the "poor man's pleoptophor." He built an extra graticule into the Euthyskop. With this he can achieve the rhythmic stimulation of the amblyopic fovea. He has the instrument placed for support on a stand, and the patient's head is stablized by use of another stand. In front of the patient's emmetropic eye Dr. Priestly has a mirror adjusted at an angle of 45 degrees to the line of sight. He also has a light placed to enable the emmetropic eye to exert steady fixation.

Dr. Burian had two other questions; one relating to the value of pleoptics, and another about my results with the method. I purposely avoided both of them. My lecture, in the time allotted, could deal only with limited aspects of technique. The problem is of a scope much too big even to be touched in a reply to a discussant. I am very much impressed with the method and the results I have seen so far.

A MAJOR CAUSE OF HYPOTONY

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THE specific cause of hypotony following operative procedures, trauma, and certain intraocular inflammations is not always readily apparent. A fistula from the anterior chamber following operation or perforating injury is an obvious explanation of hypotony in certain cases. However, there are many hypotonic eyes without such a fistula in which the cause of the hypotony is not clear. In this presentation, evidence will be cited which suggests the possibility that in at least some cases, the hypotony is due to hyposecretion of aqueous caused by a detachment of the choroid and ciliary body.

Hypotony is a frequent occurrence following cyclodialysis. The cyclodialysis operation was first reported by Heine[11] in 1905. The operation was devised as a result of the report by Fuchs[8] in 1900 on the pathologic examination of several eyes with separation of the ciliary body and choroid following cataract extraction. In most cases Fuchs found a tear in the ciliary body and concluded that there was communication between the anterior chamber and the suprachoroidal space, and that this was the cause of the choroidal separation. Since Heine's first report, the cyclodialysis operation has been employed to a greater or lesser extent in the treatment of glaucoma. Of late years the operation has been used more frequently for glaucoma in aphakia than for primary glaucoma.

Elschnig[7] in 1932 had the opportunity to make an anatomic examination of an eye fourteen years after a successful cyclodialysis operation. He found a typical cleft. He did not determine how far it extended posteriorly, but he found a separation of the ciliary body in the lower outer two thirds of the circumference of the globe. Barkan[2] reported the microscopic findings in two eyes with successful cyclodialysis of fifteen months' duration. These eyes showed an open cleft with a communication between the anterior chamber and the suprachoroidal space. The author did not state the circumferential extent of the separation of ciliary body and choroid, nor how far it extended posteriorly. In his figure 1A, the detachment appears to extend at least back to the equator on one side, and the ciliary body can be seen to be separated on the side opposite the cleft. In his figure 2, the detachment is depicted in the upper temporal quadrant and the cyclodialysis was done in the lower temporal quadrant.

It has been generally considered that the lowering of intraocular pressure after a successful cyclodialysis operation

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was the result of increase in the facility of aqueous outflow by absorption of aqueous via the choroidal vessels. Not only is there theoretical evidence against this explanation for a lowering of intraocular pressure but, in fact, other clinical and experimental evidence indicates that after a cyclodialysis, a detachment of the ciliary body and the consequent suppression of aqueous formation are important factors in lowering intraocular pressure. This is true not only after a successful cyclodialysis but also in many instances of hypotony. The evidence that we will cite for this hypothesis will be in the form of clinical observations rather than one conclusive experiment.

The lack of correlation between the circumferential extent of the width of the cyclodialysis cleft and the effectiveness of the cyclodialysis operation in lowering tension is the first observation suggesting that an increased facility of the aqueous outflow is not the mechanism by which intraocular tension is lowered in these cases. A close correlation between the presence of a gonioscopically visible cleft and the success of the cyclodialysis operation has been reported by Vannas,[17] Barkan et al.,[1] Sugar,[16] and Clarke.[4] It certainly is true that in most cases if there is no gonioscopically visible cleft, the tension is uncontrolled. However, there are exceptions to this rule in that cases have been observed in which, though no cleft was visible on gonioscopic examination, the tension remained soft. Thus, one must conclude that the lowering of intraocular pressure by cyclodialysis is not dependent upon the extent to which the ciliary body is detached from the scleral spur.

TABLE I (DEROSA)

DEPTH OF THE ANTERIOR CHAMBER IN NINE CASES MEASURED PREOPERATIVELY, TEN DAYS FOLLOWING THE OPERATION, AND TWO MONTHS POSTOPERATIVELY WITH CORRESPONDING TENSION.

	PREOPERATIVE		POSTOPERATIVE 10 DAYS		POSTOPERATIVE 2 MONTHS	
CASE	ANTERIOR CHAMBER DEPTH (MM.)	TENSION	ANTERIOR CHAMBER DEPTH (MM.)	TENSION	ANTERIOR CHAMBER DEPTH (MM.)	TENSION
1	2.9	32	2.4	16	2.4	15
2	3.1	34	2.5	18	2.5	16
3	2.8	42	2.2	19	2.2	19
4	2.94	37	2.29	18	2.29	18
5	3.68	61	2.51	12	1.67	12
6	3.63	50	2.82	14	2.66	14
7	2.1	36	1.77	12	1.67	12
8	3.2	42	2.74	19	2.64	19
9	2.09	52	1.12	10	1.22	10

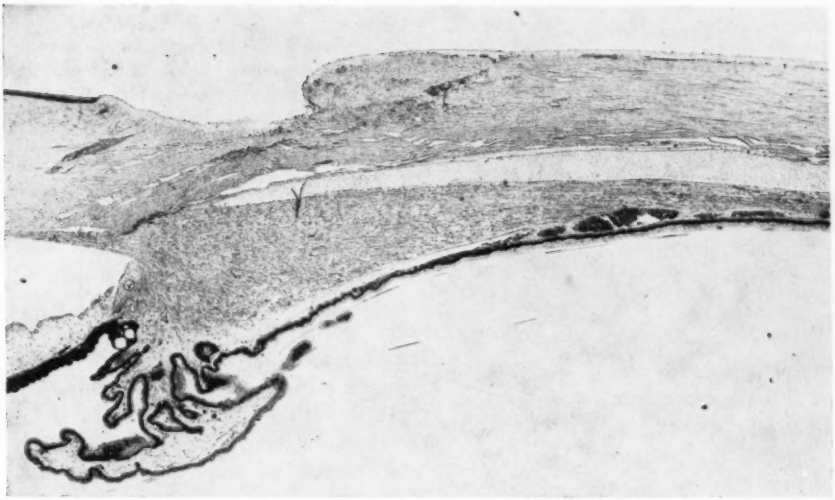

FIG. 1—Flat detachment of the ciliary body in an eye with hypotony. The eye was removed because of a choroidal tumor which proved to be metastatic.

A second finding of interest in cases of successful cyclodialysis is a diminution of the depth of the anterior chamber. In eyes with a mushy soft tension, the anterior chamber is usually extremely shallow and the angle appears almost closed gonioscopically. Goldmann[9] measured the volume of the anterior chamber preoperatively and postoperatively in two cases. In both cases the postoperative tension was quite low, 6 and 7 mm. Hg respectively. In the first case postoperative volume of the anterior chamber was less than half the preoperative volume, and in the second the volume was reduced by 40 per cent.

DeRosa[6] reported on the depth of the anterior chamber in nine cases preoperatively, then ten days postoperatively, and again two months postoperatively. His results are given in table I. It can be seen that in every case the depth of the anterior chamber was less postoperatively than preoperatively, and there was a slight correlation between the decrease in anterior chamber depth and the level of tension — the more shallow the anterior chamber the lower the tension. It can be noted that in case 9 with postoperative tension of 10 mm. Hg, the depth of the anterior chamber postoperatively was little more than half the preoperative depth. The shallowing of the anterior chamber is evidently the result of rotation of the separated ciliary body. An extreme degree of this rotation can be seen in pathologic specimens of phthisical eyes which also have shallow chambers (table I).

For the purpose of this report we did microscopic examinations of fifty eyes that had been diagnosed clinically as having very soft tension or phthisis bulbi. There was a detachment of the ciliary body in all cases. In some eyes this was limited to a very thin layer of coagulum not more than 0.5 mm. wide and extending from the scleral spur to the ora serrata (fig. 1). In other eyes the layer of fluid was much thicker and

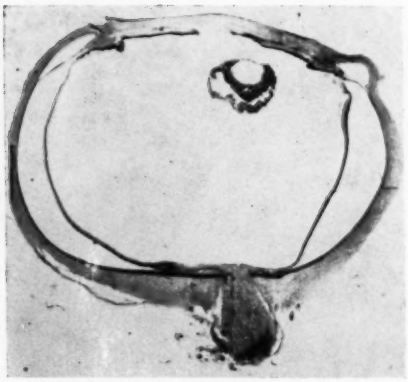

FIG. 2—Hypotony following injury. Note detachment of the uvea limited to the ciliary body and the absence of a cyclitic membrane.

extended to the optic disc. It has been suggested that the detachment in eyes of this type results from a contraction of a cyclitic membrane that pulls on the ciliary body. In five eyes this could not have been the cause of the detachment, for there were no cyclitic membranes (figs. 2 and 3). In many cases detachment of the ciliary body, whatever the mechanism, was associated with hypotony.

Treacher Collins[5] reported on the pathologic examination of the eyes with persistent hypotony following severe contusion of the globe. In some cases there was a tear in the ciliary muscle; in one case there was complete separation of ciliary body from the sclera (in effect, a cyclodialysis cleft), but in every case there was separation of the ciliary body up to the scleral spur. In a series of experiments with rabbits, Collins was able to produce hypotony by repeated paracentesis, and found in these eyes separation of the ciliary body.

Hudson[13] reported serous detachment of the ciliary body and choroid as an accompaniment of perforating lesion of the eyeball. He concluded:

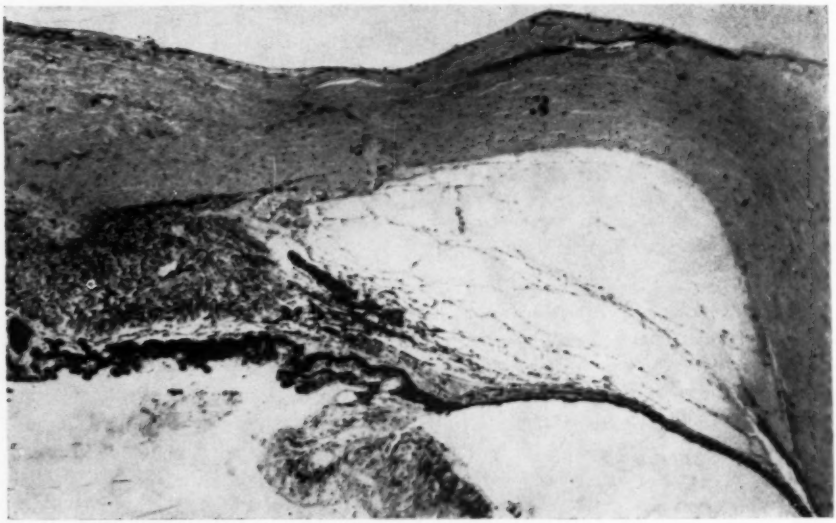

FIG. 3—Higher magnification of ciliary body detachment. Same eye as in figure 2.

1. Serous detachment of the choroid and ciliary body is the natural accompaniment of considerable reduction of the intraocular pressure, and . . . its occurrence is the rule in every case of sustained reduction of pressure.

2. The degree of detachment varies, more or less directly, as the degree of reduction of the intraocular pressure.

Few eyes in which an elevated intraocular pressure has been controlled by cyclodialysis have been studied histologically. However, in the two specimens reported by Barkan there was a detachment of the ciliary body in one eye 180 degrees from the operative site, and in the other eye a detachment was depicted in the superior temporal quadrant but a cyclodialysis had been done in the lower temporal quadrant.

The in vivo detection of detachment of the ciliary body is perhaps more difficult than in vitro diagnosis. Ciliary body detachment may be detected, however, by making an incision through the sclera 2 to 4 mm. behind the limbus and obtaining suprachoroidal fluid. We have not used this technique to detect fluid over the ciliary body in normotensive eyes after cyclodialysis, but we have done so in eyes with hypotony. In two eyes when the intraocular pressure was below 5 mm. Hg as a result of a cyclodialysis, a weak solution of fluorescein was injected into the anterior chamber and a 1 mm. scleral opening made 2 to 4 mm. behind the limbus 180 degrees away from the cleft. In each instance fluorescein-stained fluid escaped from the scleral opening, indicating a complete circumferential separation of the ciliary body. In one eye with hypotony after a basal iridectomy for glaucoma, a pinpoint separation was noted between the ciliary body and the scleral spur. Again, in this eye fluorescein-stained aqueous was obtained through the scleral opening over the ciliary body 180 degrees from the iridectomy.

A similar procedure has been done on a number of other eyes with hypotony; six of these are listed as a sample in table II. The low pressure in one eye resulted from an iridencleisis, in two eyes from a sclerectomy, in one eye from cyclodialysis, and in two eyes from iritis. It is of note that a cleft could not be found in the eye with hypotony after cyclodialysis. In each of these eyes fluid was found over the ciliary body, but in contrast to those eyes with a cleft, fluorescein-stained aqueous did not find its way into the suprachoroidal fluid. In one instance, fluid was not encountered in one quadrant but was found in another. This suggests that there is not necessarily a total detachment of the ciliary body in all eyes with hypotony.

Closely related to these findings is the problem of shallow or flat anterior chambers which may be seen after cataract extraction or a filtering operation for glaucoma. Here also there is separation of the ciliary body and usually of the choroid, with apparent suppression of aqueous formation and a very soft eye. The mechanism of the shallow or flat anterior chamber and the separation of the ciliary body and choroid after intraocular surgical procedures has been the subject of much conjecture. The most widely accepted theory is that a wound leak after cataract extraction or the obvious leak from the anterior chamber after filtering operations causes a continuing hypotony which results in extravasation of fluid from the choroidal vessels, separation of the choroid and ciliary body, and flattening of the anterior chamber. There is considerable clinical evidence in support of this theory. Repair of a wound leak has many times resulted in prompt re-formation of the chamber.

In one case of trephining, a conjunctival buttonhole was inadvertently made directly over the trephine opening, with

TABLE II
OPERATIONS FOR HYPOTONY

CASE HISTORY	OPERATION TYPE AND DATE	CLEFT PRESENT	DATE OF OPERATION FOR HYPOTONY	FLUID IN SUPRA-CHOROIDAL SPACE	FLUORESCEIN-STAINED AQUEOUS IN SUPRA-CHOROIDAL SPACE
JJJ 813421	Cyclodialysis 3/10/1957	Yes	12/1/1958	Yes	Yes
LS 351393	Sclerectomy 5/12/1958	No	11/15/1958	Yes	No
CP 771891	Iridectomy 5/9/1957	Yes	3/12/1959	Yes	Yes
WE 864826	Cyclodialysis 4/13/1959	Yes	10/28/1959	Yes	Yes
ML 847052	Iridencleisis 5/21/1959	No	2/11/1960	Yes	No
LL 876754	Cyclodialysis 5/5/1959	No	2/5/1960	Yes	No
JT 912322	Sclerectomy 12/3/1959	No	3/28/1960	Yes	No
NW	Iritis* Both Eyes	No	6/6/1960	Yes	No

*This patient had not been operated upon previously but had had a nongranulomatous iridocyclitis.

free escape of aqueous, and the anterior chamber remained flat. In this case, Grant[10] exerted pressure with a finger directly over the opening, thus closing it. In about forty minutes the chamber was fully formed, but it promptly flattened when the finger was removed. In other cases of filtering operations with a flat anterior chamber, a pressure bandage so placed that the pressure was directly over the bleb resulted in prompt re-formation of the anterior chamber. In addition, after many filtering operations resulting in an obvious bleb from the time of the operation and continuous drainage from the anterior chamber, the anterior chamber remains normal in depth and there is no separation of choroid or ciliary body. The tension may even remain indefinitely very soft, with obvious drainage through the bleb, yet the anterior chamber may remain normally deep. In cases with flat anterior chamber after cataract extraction, in many instances wound leak cannot be demonstrated. In other cases, an obvious fistula can be demonstrated for months, yet the anterior chamber remains deep and there is no choroidal separation. At first glance it might appear difficult to reconcile these two situations, no obvious wound leak but a flat anterior chamber on the one hand and, on the other hand, an obvious leak but a formed chamber. A difference in rate of aqueous formation in the two instances might be the deciding factor.

For example, in eyes in which there is an obvious fistula from a formed ante-

rior chamber, separation of choroid is not seen. Aqueous is evidently being formed at a normal rate, since it continuously escapes, yet the anterior chamber may remain formed. If the size of the fistula is small, then the rate of aqueous inflow will balance the rate of aqueous outflow.

If, however, there is a diminution in the rate of formation of aqueous, even a very small leak from the anterior chamber may result in a flat anterior chamber. In the cases of postoperative flat anterior chamber, there is apparently always separation of the ciliary body and choroid, whether or not it can be detected ophthalmoscopically. This separation can be demonstrated by obtaining fluid through a sclerectomy prior to forming the anterior chamber by injection.

An explanation of why in some cases of flat anterior chamber after cataract extraction or filtering operations no choroidal detachment is visible ophthalmoscopically is provided by an observation of Grant.[10] He did a very interesting experiment using a normal enucleated human eye. The cornea was excised, an iridectomy was done and the lens was removed. A needle was then passed through the sclera in a slanting fashion over the ciliary body. When fluid was injected, a moundlike elevation of ciliary body and choroid was observed on examination with a dissecting microscope. After a short period no elevation of ciliary body or choroid could be seen. The fluid under the ciliary body and choroid had diffused into a thin layer over a larger area and was no longer detectable. When more fluid was injected and another moundlike elevation was produced, this likewise disappeared. It could then be observed in the coloboma of the iris that the ciliary processes had rotated and now lay in the plane of the cornea.

The mechanism of separation of the ciliary body and choroid in cases of flat anterior chamber has generally been considered to be caused by extravasation of fluid from the choroidal vessels as a result of the hypotony induced by opening the eye. O'Brien[15] found a high incidence of choroidal detachment immediately after cataract extraction. Capper and Leopold's finding of hypotony plus trauma as a cause of choroidal detachment[3] would appear to apply to all intraocular operations.

Another possible mechanism in separation of the ciliary body after intraocular surgery is the inadvertent formation of a traumatic communication between the anterior chamber and the suprachoroidal space. In several cases of flat anterior chamber, both after cataract extraction and after filtering operations for glaucoma, we have been able to demonstrate the presence of such a communication—in effect, a cyclodialysis. This was done by injecting fluorescein into the anterior chamber and obtaining stained fluid from the supraciliary body space.

That such a communication between anterior chamber and suprachoroidal space can close and open spontaneously is well illustrated in the following case. A thirty-three-year-old female developed subacute angle closure glaucoma, and a peripheral iridectomy was done on the right eye. The operation was thought to be uneventful. Postoperatively the anterior chamber remained flat and a leaking wound was demonstrated. The wound was repaired with additional sutures and a tight closure obtained. However, the anterior chamber remained very shallow and tension mushy soft with considerable blurring of vision. Gonioscopically, the angle appeared entirely closed. No cleft was visible, but no ciliary processes were visible in the coloboma, suggesting that a portion of

the ciliary body had been excised along with the peripheral iris. No choroidal separation was visible. An opening was made in the sclera 4 to 5 mm. from the limbus 90 degrees circumferentially from the site of the iridectomy, and there was copious escape of fluid. However, the anterior chamber remained extremely shallow and the tension mushy soft. A few days later a drop of a weak solution of fluorescein was injected into the anterior chamber and the sclera opened 180 degrees circumferentially from the site of the iridectomy. Fluorescein-stained fluid escaped. Air was injected into the anterior chamber. When the air was absorbed, the anterior chamber was again extremely shallow and the tension soft, with vision blurred.

Two months later the vision suddenly cleared and the patient saw halos about lights. The anterior chamber was found to be of normal depth and tension 35 mm. Hg (Schiøtz). Pilocarpine was prescribed. Tension first fell to 20 mm. Hg (Schiøtz), then the eye became very soft, the anterior chamber again became shallow, and vision was blurred. Treatment was discontinued. During the next few months, periods of clear vision altered with periods of blurred vision. When the eye was examined months later, tension was 30 mm. Hg (Schiøtz), the anterior chamber was normal in depth, and vision was 20/15. A weak miotic was prescribed. Since that time tension has been maintained in the low 20's, vision has remained 20/15, and the anterior chamber is of normal depth.

Here then is a case in which a traumatic communication was made between the anterior chamber and the suprachoroidal space in the course of doing a peripheral iridectomy. The cleft spontaneously closed and was evidently reopened by treatment with strong miotics. Later, judging by the patient's vision, it closed and opened repeatedly until finally it remained closed, with a normal anterior chamber and normal vision. Further observations may determine that accidental cyclodialysis in the course of surgical procedures for cataract or glaucoma plays a part in the problem of delayed re-formation of the anterior chamber.

In summary, we have found that detachment of the ciliary body is a frequent finding in eyes with hypotony following cyclodialysis, iridectomy, cataract extraction, and glaucoma filtering procedures. Likewise, fluid has been found in this region in eyes with mushy soft tension following severe iridocyclitis. Histologically, a coagulum has been found between the sclera and ciliary body in a great number of hypotonic eyes that have been enucleated. Finally, the depth of the anterior chamber decreases after a successful cyclodialysis due to detachment and rotation of the ciliary body.

Is there further evidence that detachment of the ciliary body may cause hyposecretion and a lowering of the intraocular pressure? Negative evidence in favor of this idea is obtained from the patients who had large cyclodialysis clefts but elevated intraocular pressure. These patients showed that absorption of fluid by the choroidal vessels in the cleft alone was not sufficient to reduce the intraocular pressure.

The first patient was a 9-year-old colored boy who has a traumatic glaucoma with recession of the angle of his anterior chamber following a blunt injury. A cyclodialysis was done above with a resulting cleft extending from approximately the 11:00 to the 1:00 o'clock position. The intraocular pressure was normalized for a period of about two weeks, then it became elevated to 35 to 50 mm. Hg (Schiøtz). The use of intensive miotic therapy and 250 mg. of Diamox four times a day did not appreciably reduce his intraocular pres-

sure. Several months after operation the cyclodialysis cleft was still open in the area from 11:00 to 1:00 o'clock and extended as far back over the ciliary body as one could observe with the gonioscope. The patient was then operated upon again. An incision was made through the sclera about 3 mm. behind the limbus at the 3:00 o'clock position, and no fluid was encountered over the ciliary body. An iris spatula was then passed parallel to the limbus from the 3:00 o'clock to the 1:00 o'clock position, and when the margin of the cleft was encountered, fluid was obtained through the opening at the 3:00 o'clock position. A similar procedure was done at the 9:00 o'clock position and, again, fluid was not found over the ciliary body but was encountered when the cyclodialysis spatula was passed over the ciliary body to the cleft at the 11:00 o'clock position. In this case the separation of the ciliary body was confined to the region of the cleft and the tension remained elevated.

The second patient had a somewhat similar history. This was a 52-year-old colored female who had had a cyclodialysis for open angle glaucoma. Four days after operation a 5 mm. bubble of air could be seen in the anterior chamber when she was lying flat on her back but disappeared into the cyclodialysis cleft when she sat up. The patient's intraocular pressure was 2/7.5, or 35 mm. Hg (Schiøtz) in spite of the use of intensive miotics and Diamox therapy. The tension remained elevated for a period of approximately one month, then dropped to 3.5/5.5, or 23 mm. Hg (Schiøtz). Miotic and Diamox therapy were discontinued, but the tension continued to fall and finally reached 8/5.5, or 10 mm. Hg (Schiøtz). During this time there was no change in the appearance of the cyclodialysis cleft. It was thought that in this patient the detachment of the ciliary body was at first localized to the cleft, but after one month it extended further over the ciliary body.

Another finding which supports the theory that detachment of the ciliary body produces hyposecretion is the results of operations designed to cure hypotony. In three patients who had hypotony following cyclodialysis, the intraocular pressure returned to a normal level when the fluid over the ciliary body was drained and the cyclodialysis cleft was walled off. The latter was done by making a barrage of diathermy punctures through the sclera beyond the circumferential extent of the cyclodialysis and extending 5 to 6 mm. behind the limbus. In two patients the tension returned to normal and remained there for the ten months these cases have been followed. In one patient the intraocular pressure rose from 13/5.5, or 4 mm. Hg (Schiøtz), to 2/5.5, or 26 mm. Hg (Schiøtz), for a period of three days postoperatively; then the eye again became hypotonic. In none of these three cases was the ciliary body reattached to the scleral spur, so there was a residual cleft over the ciliary body in spite of the fact that tension returned to normal. In a fourth patient no cyclodialysis cleft could be seen prior to reoperation, but after drainage of the suprachoroidal fluid the intraocular pressure returned to a normal level and remained there for six months. In three other eyes that were hypotonic as a result of excessively filtering fistulizing operations, the tension returned to normal when fluid was drained from the ciliary body and an attempt was made to localize the external conjunctival bleb. It is entirely possible that the rise in intraocular pressure in these latter cases could have resulted from the reduction of external filtration by the surgical procedure performed on the conjunctiva. Thus, it appears that reattachment of the ciliary body in a hypotonic eye re-establishes aqueous formation and raises intraocular pressure.

Still further evidence of hyposecretion stems from four patients who had hypotony and upon reoperation were found to have a detachment of the ciliary body. These patients had submitted to an operation for glaucoma three years prior to the operation for hypotony. They were given 5 cc. of a 10 per cent solution of fluorescein intravenously. In one patient the fluorescein was visible in the soft eye for a period of approximately forty-eight hours but cleared in the normotensive eye in about ten hours. In the other three patients the fluorescein remained in the hypotonic eye for a period of thirty-six to forty-eight hours but cleared from the other eye in twelve to twenty-four hours. This observation suggests a stagnation of aqueous in the soft eye.

Goldmann[9] studied four cases of cyclodialysis with his fluorescein method preoperatively and postoperatively. The tension postoperatively was 6, 7, 5 and 7 mm. Hg respectively. He estimated the pressure in the aqueous veins to be approximately 10 mm. Hg; therefore, there could be no outflow from the anterior chamber via Schlemm's canal. In his first case the preoperative outflow was 1.5 cu. mm. per minute; fourteen days postoperatively it was only 0.16 cu. mm. per minute. In the second case the preoperative outflow was 1.5 cu. mm. per minute, and nine and one-half months postoperatively it was 0.7 cu. mm. per minute. In two other cases no preoperative data were available, but four and one-third years postoperatively the outflow was 1.0 and 1.35 cu. mm. per minute respectively. He felt that his data indicated that at least for a few months postoperatively there was almost complete suppression of aqueous formation and that later there was a relative increase in outflow, probably via the choroidal vessels. Goldmann stated at that time that further investigation would reveal whether or not fluid in the suprachoroidal space actually inhibited aqueous formation.

There are other observations which strongly indicate that stagnation of the aqueous occurs when the ciliary body is detached. One of the most obvious of these is the soft tension that occurs in eyes with flat anterior chambers following cataract extraction. Frequently, in these patients a thorough search for an external filtration reveals no evidence of a fistula. The angle of the anterior chamber is completely blocked by the iris, particularly when a round pupil extraction has been done. If aqueous was being secreted in a normal manner in such patients, they most certainly would have an elevated rather than a lowered intraocular pressure. As has been mentioned previously, fluid has been found over the ciliary body in all eyes of this type on which we have made an opening through the sclera.

One complication that occurs more frequently following cyclodialysis than after other glaucoma filtering procedures is the development of cataract, not related to direct operative trauma. It is entirely possible that the hyposecretion in such patients contributes to the formation of this type of lens opacity. Linnér[14] has shown that there is a reduction in the rate of aqueous flow in human eyes with senile cataract.

Evidence has been cited as to why we think hypotony is related to detachment of the ciliary body and consequent hyposecretion. However, it does not follow that all choroidal detachments produce a lowering of intraocular pressure. Thus, the tension may be markedly elevated following an expulsive hemorrhage into the choroid at the time of cataract surgery. In these patients the anterior chamber is frequently flat after operation. In cases of malignant glaucoma, following surgical intervention the ante-

rior chamber is likewise extremely shallow or flat, but here the tension is extremely high, since the eye presumably continues to form aqueous at a normal rate. Hogan[12] has examined a number of eyes removed following malignant glaucoma and reports that no separation of the ciliary body was observed in any case. In one of our specimens of an eye removed following malignant glaucoma, there was a shallow choroidal separation due to hemorrhage and separation of the posterior part of the ciliary body, but the separation did not extend as far forward as the scleral spur. The finding in this case would suggest that it is the separation of the anterior part of the ciliary body adjacent to the scleral spur which is important for the reduction of aqueous formation.

It has been observed that in some eyes following scleral buckle for surgical correction of detachment of the retina, the anterior chamber has become extremely shallow and the angle closed with considerable elevation of tension. In two such cases, when the sclera was opened about 8 to 9 mm. from the limbus, a few drops of fluid escaped. In these cases the anterior chamber became deeper and the angle open. Here there is the paradox of separation of the choroid and an elevated tension. No pathologic specimens of this condition are available, and we can only assume, as in the case of malignant glaucoma cited above, that the separation of the ciliary body did not extend as far forward as the scleral spur and that the eye continued to form aqueous at the normal rate.

SUMMARY

Clinical observations have been cited which suggest that the cause of hypotony in eyes in which there is no external filtration is a serous detachment of the ciliary body. Through some mechanism which is not known at the present time, a thin layer of fluid in the suprachoroidal space between the sclera and ciliary body prevents secretion. The fluid apparently must extend anteriorly to the scleral spur before it affects secretion, since cases have been observed of posterior choroidal detachment in which elevated intraocular pressure was present.

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DISCUSSION

JOHN H. DUNNINGTON, M.D., New York: Since postoperative hypotony has long been of great interest to me, I am glad of this opportunity to discuss Drs. Chandler and Maumenee's informative paper. They have clearly described the findings in these cases and have given us their interpretation of the sequence of events. They believe that in the absence of demonstrable fistulization of the operative wound, the primary cause of postoperative hypotony is separation of the ciliary body, which in turn leads to a diminished output of aqueous humor. It may be of purely academic interest, but there are findings which suggest that the diminished production of aqueous humor is the initial change and that the separation of the ciliary body may be secondary to this lessened output. In support of this contention are the results of Bellows and Chinn's studies on the rate of formation of aqueous humor. They found its flow became greatly reduced in the presence of a fistulizing wound. Although these authors did not examine miscroscopically the globes of their experimental animals, it is reasonable to assume that the trauma was insufficient to produce a separation of the ciliary body. Weekers has demonstrated that in uveitis with hypotony less aqueous is formed; whereas, in uveitis with normal tension the minute volume of aqueous humor is unaffected. Pappas and Smelser's electron microscopic findings in the cells of epithelium of the ciliary processes are also of interest. These investigators have noted that the changes in the cells after the administration of Diamox are identical to those seen in eyes with fistulizing wounds. Is it not possible that these alterations in the cells are the result of reduced output of aqueous humor?

The clinical history of most cases of persistent flat anterior chamber and hypotony after cataract extraction also strongly suggests that reduction in the formation of aqueous humor plays an important role in producing this complication. For the first few days the anterior chamber is present and the globe hypotonic; then as the tension approaches normal, aqueous humor seeps through the interstices of the wound and the anterior chamber flattens. In this type one can postulate that as the drainage continues, less aqueous humor is formed and the ciliary body and choroid becomes progressively more detached. Under these conditions so little fluid is formed that it is not surprising that we often fail to demonstrate seepage from these wounds. Drs. Chandler and Maumenee's suggestion that in these eyes the initial pathologic change may be a traumatic cyclodialysis is most interesting. However, does not the early presence of the anterior chamber indicate a functioning ciliary body? In my experience, persistent failure of the anterior chamber to reform has been the result of external fistulization, which can be remedied only by wound repair.

Although there may be differences of opinion on both the original cause and the sequence of events, the method of treatment reported has much to recommend it. As the authors state, when surgery is required for a flat anterior chamber, evacuation of the subchoroidal fluid is an essential part of the operation. I should like to ask the authors if, to effect a cure, it is necessary to evacuate the fluid from beneath the ciliary body? Can not the same result be obtained by confining the drainage to the area of the pars plana? I have had insufficient experience with hypotony after cyclodialysis to comment upon their method of treatment, but I am greatly indebted to them for calling to my attention this rational approach. It has been both a privilege and a

pleasure to participate in this presentation, and I look forward with eagerness to a more detailed report upon the results of their surgical treatment of hypotony.

DR. MAUMENEE: I wish to thank Dr. Dunnington for his excellent suggestions.

First, in regard to his observation that Bellows noticed that a fistula caused a decrease in secretion, it is very interesting that Treacher Collins produced hypotony in this way in 1913 and noticed histologically in experimental animals that these animals had detachment of the ciliary body.

Also, Leopold and his co-workers have repeated this work and have extended these observations. They pointed out that detachment of the choroid occurs in experimental animals only when hypotony from a fistula is accompanied by trauma to the eye.

As far as Weekers' observation on uveitis is concerned, one of the patients listed in this paper had bilateral hypotony secondary to uveitis. An incision through the sclera over the ciliary body released a large amount of fluid. This was found in both eyes. So, I can say that in one patient with hypotony and uveitis, at least, there was fluid over the ciliary body. Whether it was the initial cause of the hypotony or followed the hypotony, one can't say in this specific case.

In regard to Pappas' and Smelser's observation, I guess it is like the chicken or the egg and which comes first — the decrease in secretion and the detachment of the ciliary body or does a very small detachment of the ciliary body produce the hyposecretion. I think this is something we will have to observe further.

There are two observations that favor the belief that detachment of the ciliary body can cause hyposecretion. In a histologic examination of two eyes that had functioning cyclodialysis, Elschnig found that there was a detachment of the ciliary body over two thirds of the globe. In Barkan's histologic illustrations, in one eye there was detachment of the ciliary body 180 degrees away from the cyclodialysis cleft; in the other eye the cyclodialysis had been performed in the lower nasal part of the eye, and histologic sections demonstrated a detachment of the ciliary body in the superior nasal part of the eye.

Also, the fact that merely draining fluid from the supraciliary body area in patients with hypotony produces a rise in tension within a matter of twelve hours would suggest that the detachment of the ciliary body was causing the hypotony, rather than the other way around.

The final question Dr. Dunnington asked was: Does it make any difference whether you drain fluid from over the ciliary body or anywhere over the choroid? In a great number of cases it makes no difference, particularly if you can observe a choroidal detachment, because the choroidal detachment extends forward over the ciliary body. However, Dr. Chandler has observed one case of malignant glaucoma in which there was a detachment of the choroid and high pressure. Also, we know of cases of detachment of the choroid from choroidal hemorrhage in which histologically there is not a detachment of the ciliary body, and the pressure may be very high. Our evidence is limited on this, but we feel that for the hypotony to occur, there has to be a detachment of the ciliary body and not merely detachment of the choroid.

In the histological specimen I showed, the detachment was localized over the ciliary body and did not extend back over the rest of the choroid.

Addendum

Mr. J. Z., a 68-year-old white male (JHH History 986687). This patient was first seen on September 23, 1959, at which time he had an extremely shallow chamber in his right eye with a moderate lenticular opacity and visual acuity of 20/40. His left eye had been lost as a result of acute congestive glaucoma. The patient was advised to have a prophylactic iridectomy, but he decided against this.

The patient was not seen again until March 27, 1961, when he gave a history that on March 18 he had had an acute congestive attack of glaucoma in his right eye. This was controlled by medical therapy. When checked on March 27, his visual acuity was correctible to 20/200. He had a marked striate keratopathy, an anterior chamber that was less than 1 mm. in depth, and a tension that measured 8/5.5 or 10.2 mm. of mercury. The patient was admitted to the hospital for an iridectomy, but prior to performing this operation, an incision was made over the ciliary body and several drops of fluid were found in this area. When last seen on May 10, 1961, his tension measured 5/5.5 and his striate keratopathy had disappeared. His visual acuity, however, was still reduced to 20/200.

THE ELECTRORETINOGRAM IN CENTRAL RETINAL DEGENERATION

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BY INVITATION

OVER a period of several years the Electroretinography Laboratory of the Kresge Eye Institute has evaluated a large number of patients having as their chief complaint, loss of central vision. These patients were characterized by marked reduction in visual acuity, central scotoma by tangent screen testing, and visible retinal changes in one or both eyes. Each patient was evaluated at least once by a standard electroretinographic test as evolved in this laboratory.[13]

Without attempting to classify central retinal degeneration, its causes and pathology, we have divided our cases into the following categories: (1a) juvenile and (1b) adult familial central pigmentary degeneration; (2) Kuhnt-Junius disease or disciform degeneration of the macula, with or without associated angioid streaks; (3) senile macular degeneration; (4) chorioretinitis involving the macular area; (5) retinitis pigmentosa involving both peripheral and central elements.

It is the purpose of this paper to show that the electroretinogram is frequently affected in central retinal diseases and that electroretinography is an additional means by which to evaluate these disease processes. The electroretinograms to be described all were obtained by the standard technique using light stimuli which supposedly affect the whole retina. These electroretinograms represent "mass-responses" of a system of which the central visual area is only a very small part. Electroretinographic changes associated with central retinal disease, therefore, most likely indicate that the disease process extends beyond the macular and perimacular areas even when the clinical signs are confined centrally.

In the cases to be described, the changes in the electroretinogram were generally similar. Rather than attempt to describe each individual case, we will select several which we feel are of particular interest.

METHOD

The method used in this study has been reported elsewhere.[12,14] In each case a standard protocol has been followed. We are perfectly aware that variations in our technique might bring out additional features of interest. However, in order to compare the abnormalities of the diseased eyes with normals, it proved best to follow a regular protocol in each case.

With our procedure the patient is seated in a comfortable chair facing the

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flashing unit of a standard Grass photic stimulator, one meter from his eyes. A contact lens silver electrode is placed over the cornea of each eye, utilizing the tears for contact. A cathode ray oscilloscope, which sweeps in synchrony with the photic stimulus, records the potentials after suitable amplification. Photographs are taken of each response or of several superimposed, utilizing Polaroid film. The pupils are maximally dilated by 10 per cent Neosynephrine or 1 per cent Cyclogyl. The test starts when the pupillary response to a bright light is absent. This requires a waiting period of 30 to 60 minutes during which the patient adapts to a room illumination of 0.4 foot-candles. The first stimuli are given at this level of illumination. The second part of the test begins after the patient has been in almost total darkness for a period of five minutes.

In the figures and in the text, abbreviations such as "LO 16" or "D Green 16" indicate the properties of the stimulus which elicited the electroretinogram (ERG). L and D refer to the background illumination at which the stimulus was given: L indicates a room illumination of 0.4 foot-candles, D denotes almost complete darkness to which the patient was adapted initially for five minutes. The following term ("O," "Green," "Red," etc.) indicates the quality of the light flash: "O" that no color filters were interposed in the light path, "Green," "Red," etc., that the corresponding filter was used as supplied with the Grass photic stimulator. The next term, "1," "4" or "16," denotes the intensity of the flash according to the intensity settings of the Grass stimulator. A single flash was given in each instance, except for flicker recordings, when the stimulus frequency was 20 per second or 50 per second. Recordings of the flicker response were made when the response had become stable during flicker application.

The whole test, as employed in the cases to be reported, involved the taking of about fifteen pictures in about fifteen minutes after dark adaptation (five minutes). The interval between two stimuli was predetermined and varied according to the stimulus intensity. It was 10, 30 and 60 seconds following a flash of intensity 1, 4 and 16 respectively. The frequency response characteristics of the amplifiers, upon which the quality of the record largely depends, were the same for each patient and were checked during each test. Throughout the main parts of the test, the 50 per cent responsiveness was 0.1 and 250 cycles per second. The limit of high frequency responsiveness was increased to 50 per cent at 2,000 cycles per second during each test for some high sweep speed records of the responses to maximal stimulus and for certain flicker records. The cathode ray sweep speed at the screen was 50 milliseconds per inch (msec./inch) except for high sweep speed records, when it was 25 milliseconds per inch and 10 milliseconds per inch. The latter records were used for exact time measurements and for the evaluation of the a-wave components and the fast components at the start of the b-wave.

Figure 1 illustrates the tracings of four normal electroretinograms to different stimuli or sweep speeds. They are included to note the designations of the waves and peaks used in this laboratory. Cornea-negative peaks are labeled *n;* cornea-positive peaks are labeled *p.*

The normal tracings have been selected from the mean of a group of 55 normal subjects who have had complete eye examinations and electroretinographic workups. The values obtained were subjected to standard statistical analysis.

Each figure in the text has a normal

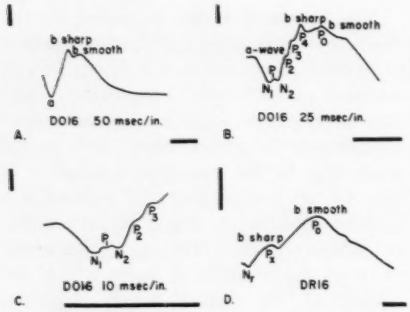


FIG. 1—Tracings of four normal responses denote the designations attached to the various components of the electroretinogram (ERG.).

(A) DO 16. Response to a maximum intensity (16) stimulus in the Dark (D) with no filter (O) is labeled as noted. The cathode ray sweep speed is 50 msec./inch. This is the standard sweep speed used through most of the routine protocol. The standard sweep speed compresses the components of both the a-waves and the b-waves so that details in wave configuration are lost.

(B and C) Designations for the a-wave and the b-wave when the sweep speed has been increased to accentuate the various components of each wave. The horizontal bar denotes 50 milliseconds in all figures. The vertical bar denotes 200 microvolts in all figures.

(B) Tracing of normal ERG recording with a faster sweep speed (25 msec./inch) than (A). Stimulus conditions are the same (DO 16). The letter *n* refers to cornea-negative deflections, the letter *p* to positive ones; p_O indicates the peak of the "scotopic" b-wave, which is determined by its smooth contour; b sharp is the highest peak of the b-wave occurring as the last and strongest of the "humps" on the fast rising b-wave.

(C) Tracing of a normal ERG recorded with an even faster sweep speed, 10 msec./inch. Stimulus conditions are the same.

(D) Tracing of a normal ERG in response to red light stimulus (DR 16; dark, red filter, intensity 16). Standard sweep speed (50 msec./inch) is utilized. There are essentially a low amplitude a-wave and two cornea-positive b-waves, a fast and a slow one. The fast wave is identical with the "x-wave" of the literature; its peak is designated p_X. The slow wave represents the scotopic component of the response and is designated p_O.

selected from the above group to compare with the abnormal.

RESULTS

The first case is one of a series of six cases of familial central pigmentary degeneration. The electroretinographic changes in this case are representative of the whole series.

Case 1

J. T. (K155), 60-year-old white male of Italian origin, was seen in the office of A. D. R., Jr., approximately fourteen years after loss of central vision in both eyes. The past medical history contributed no information pertinent to the case.

Family History: The patient has one sister with loss of central vision and a similar degenerative process in both eyes. Another sister has angioid streaks with no central or peripheral scotomas. A daughter (age 35) of the patient and a daughter (age 27) of the affected sister have normal eye examinations and electroretinograms.

Eye Examination: Vision in the right eye is 18/50-1; vision in the left eye is reduced to light perception and projection. External examination reveals only normal findings except for sluggish pupillary responses to light. The central fields (9/29/58) reveal a large central scotoma in either eye (fig. 2). The ophthalmoscopic examination reveals the media clear. Each eye shows a large area of central pigmentary degeneration (fig. 3). The affected region looks much like a patch of scorched field after a grass fire. It includes practically the whole posterior retina. Discs and vessels appear within normal limits; no retinal hemorrhages. Clinically the process appears to be inactive.

Electroretinographic examination (11/14/58). Figures 4 to 8 compare the electroretinograms of the patient with those of a normal subject whose amplitude and time measurements are near the means of the normal range (in this laboratory). The broad line tracings are the responses of the left eye; the fine line tracings, those of the right eye, in all the figures.

Figure 4 shows the response to a high intensity stimulus (16), without the use of a color filter (0). The graphs at the left were obtained while the patient was light adapted (L) to 0.4 foot-candle; the graphs at the right were taken in the dark (D) after an initial dark adapta-

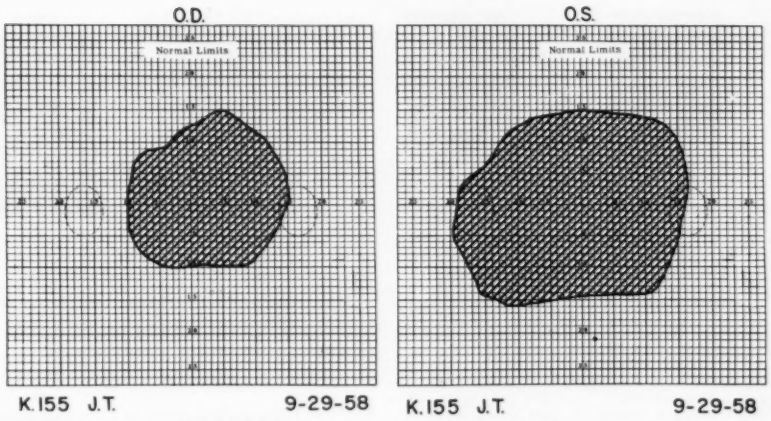


FIG. 2—Case 1 (K155). Central fields to 3/1000 white, right and left, reveal a large central scotoma.

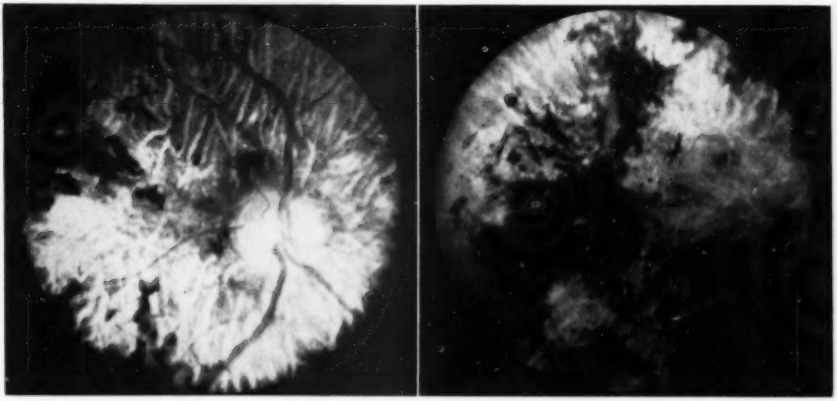


FIG. 3—Case 1 (K155). Fundus photos from the right and left eyes reveal a large area of central retinal degeneration with pigment hyperplasia.

tion period of five minutes (see *Method*). The over-all amplitudes are reduced in comparison to the selected normal subject. They are about half the mean normal values, which places them outside the range of normal variations (to be discussed in more detail in a subsequent publication). On a percentage basis, the reduction is slightly greater for the "photopic" response (LO-16) than for the "scotopic" one (DO-16). (It is to be noted that the amplification of the normal electroretinogram at DO-16 is only half that used in this patient.)

The reduction in amplitude (fig. 4) is evident for both the a-waves and the b-waves; however, the a-wave is somewhat more affected, as seen especially with DO-16. As it was often noted in these cases, the a-wave also has a different form than that of normal subjects, Its downward slope is convexly shaped,

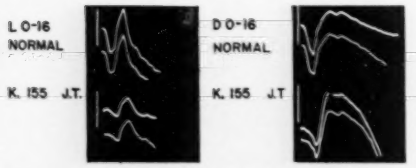


FIG. 4—Case 1 (K155). The ERG recordings from this patient are compared to those of a normal person whose measurements for each response were near the mean value of the normal range. (Over 55 normal subjects have been studied in order to establish normal values for each component of the standard protocol.) In each figure the upper recording is the normal response for the left and right eyes. (Upper left) LO 16. Light adaptation, no filter, intensity 16. Normal subject. Broad tracing is the left eye; narrow tracing is the right eye. (Lower left) LO 16. K155. There is a marked reduction in both the a-wave and the b-wave. (Upper right) DO 16. Dark adaptation, approximately 7 minutes; no filter, intensity 16. Normal subject. (Lower right) DO 16. K155. Both a-wave and b-wave are reduced. The a-wave has a characteristic convex curvature to a sharp a-wave peak.

In the upper left hand corner of each recording is a vertical bar which is equivalent to 200 microvolts. In some recordings amplification was reduced to one half to get the whole record on the screen. A horizontal bar represents 50 milliseconds.

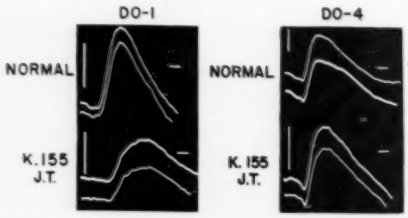


FIG. 5—Case 1 (K155). DO 1. Dark adaptation 5 minutes, no filter, intensity 1. DO 4. Dark adaptation, no filter, intensity 4. The comparison to the normal indicates a reduction in both a-wave and b-wave. As stimulus intensity is increased, accentuating the a-wave response, there is a characteristic convex curvature of the a-wave. Note that amplification is reduced in the upper right recording.

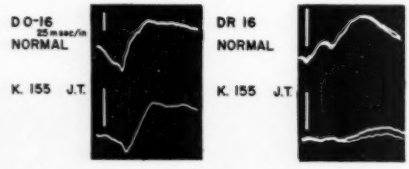


FIG. 6—Case 1 (K155). (Upper left) DO 16, normal subject, left eye, 25 msec./inch, which is twice the standard sweep speed. (Lower left) K155, left eye. Note that the n_1 is gone and p_1 is barely evident. The amplitude of n_2 is reduced. The "humps" on the b-wave are missing. Note that amplification in the lower right recording is twice that of the upper recording. (Upper right) D red 16, normal subject, both eyes. (Lower right) All the components of the ERG are reduced.

and a late, sharp negativity (n_2) precedes the b-wave.

Figure 5 shows the response in the dark to a low (1) and to a medium (4) stimulus intensity (DO-1, DO-4). The reduction in amplitude is clearly associated with a diminished responsiveness: the b-wave with DO-1 occurs with a greater delay and is slower in its rise and fall than that of a normal subject tested with the same stimulus. In a fashion similar to the DO-16 response of the preceding figure, the DO-4 response displays the abnormal convexity of the a-wave and the accentuation of n_2.

Figure 6 illustrates with a faster sweep speed (DO-16, 25 msec./inch) the change in the form of the a-wave. Its initial slope is gradual and flattened, but its later slope is steep and accentuated. The b-wave also rises more slowly than is normal, probably because the fast "humps" (p_2, p_3, p_4), which are superimposed upon the rising phase of the b-wave, are depressed. The response to red light (DR 16; dark, red filter, high stimulus intensity) is significantly reduced. This reduction involves both the fast positive component (p_x) and the slow positive component (p_o), but in comparison to our control values, the reduction in p_x is more pronounced than that of p_o.

The response to blue light (DB 16, fig. 7) displays particularly well the change in the form of the a-wave. It seems that n_1 is absent, and that n_2 is the only negativity present. Figure 7 also shows a rounding of the b-wave, "b-

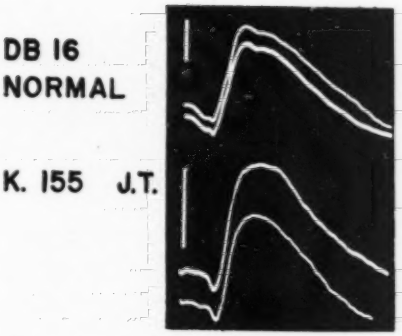


FIG. 7—Case 1 (K155). DB 16. Dark adaptation, blue filter (Grass), intensity 16. Comparison with the normal reveals reduction and convex curvature of the a-wave and reduction and rounding of the b-wave; note that amplification in lower record is twice that of upper record.

sharp" being little evident. This particular b-wave phenomenon was noted often in the cases of familial central degeneration.

The abnormality in the retinal functions of these cases was most strikingly manifested by the reduced responsiveness to flicker light. In figure 8 the response to a 20/sec. flicker with medium stimulus intensity (4) is shown for the test in the light (LO-4) and for the test in the dark (DO-4). The response is greatly reduced and lacks the sharp peaks of the normal flicker electroretinogram.

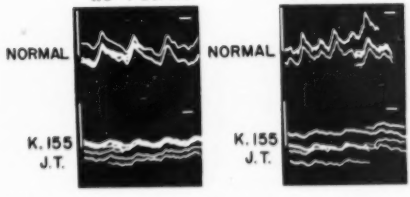


FIG. 8—Case 1 (K155). (Left side) LO 4. Light adaptation, no filter, 20/second. (Right side) DO 4. Dark adaptation, no filter 20/second. The left side records are taken at the conclusion of the light adaptation portion of the standard protocol. The right side records are taken at the conclusion of the dark adaptation portion of the standard protocol. In either case the usual characteristics of the flicker ERG are obliterated.

In our records of this type of case (6 cases) the abnormality is the same for both eyes, indicating that the disease process is truly bilateral though the central defect is not identical.[13]

The next case is an example of arteriosclerotic senile degeneration which involved the posterior polar areas. The electroretinogram mainly displays bilateral amplitude reduction, the differential electroretinographic changes, such as those of a-wave and flicker waves, being less evident than in case 1.

Case 2

S. G. (K359), 80-year-old white male, was first seen in the office of A. D. R., Jr., in 1950 with a diagnosis of disseminated posterior polar degeneration in both eyes. Visual acuity when first seen was 20/40 in either eye. Past medical history and family history were noncontributory in the diagnosis. Between 1950 and 1959 there has been slow progression of fundus changes with gradual loss of vision in both eyes.

Eye Examination (1959): Vision in the right eye is 20/200 with correction; left eye, 20/50-1 with correction. The external examination reveals only normal findings. The visual fields reveal a central scotoma, right and left, to 3/1000 white (fig. 9).

Ophthalmoscopic Examination: Media clear. The entire posterior polar area temporal to the disc shows marked degenerative changes with an occasional hemorrhage near the periphery. There is marked arteriosclerosis and central pigmentary hyperplasia (fig. 10). The right eye is more affected than the left.

Electroretinographic examination (12/17/59): Figures 11 to 15 illustrate the electroretinograms of this case. The reduction in amplitude is evident throughout. Responsiveness to low intensity stimuli is markedly diminished (LO 1, DO 1). The a-wave is slightly more de-

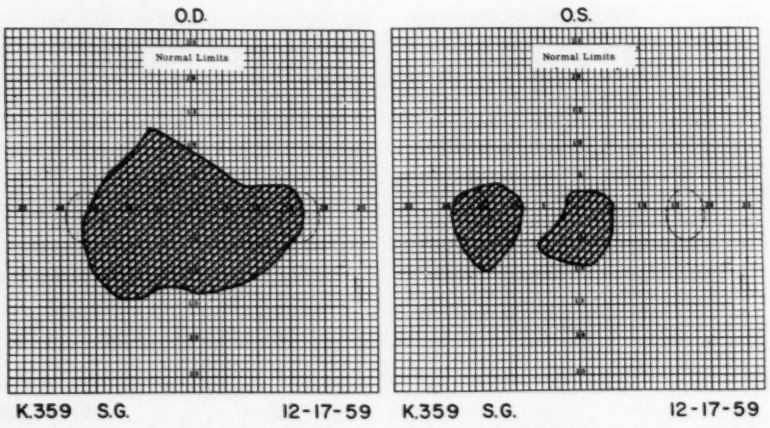


FIG. 9—Case 2 (K359). Central fields to 3/1000 white, right and left. Note the large central scotomas, O. U.

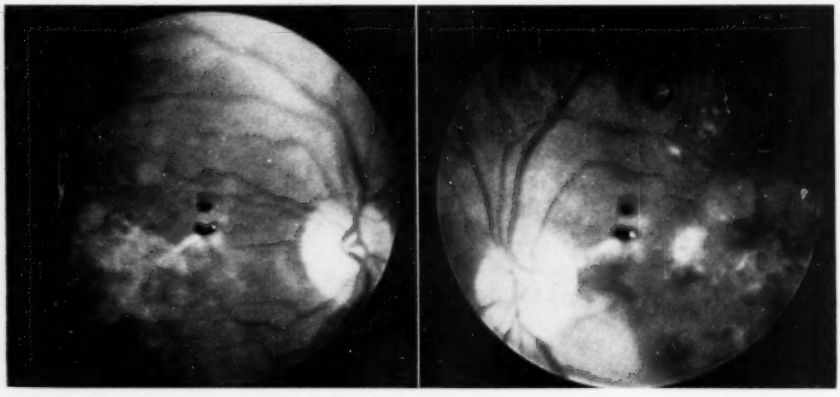
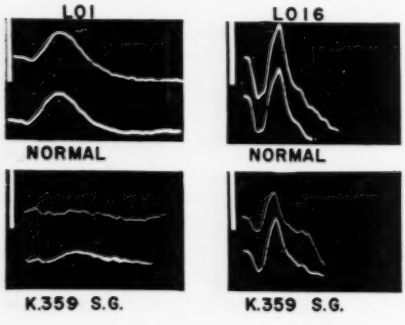


FIG. 10—Case 2 (K359). The fundus photographs illustrate the severe posterior central retinal degeneration.



pressed than the b-wave (LO 16, DO 4, DO 16). The fast positive components (DO 16) are little affected in a selective manner, and even the flicker response, though much reduced, shows relatively

FIG. 11—Case 2 (K359). (Left side) LO 1. (Right side) LO 16. A comparison of the normal with the abnormal to low and high intensity stimuli indicates that there is a marked reduction in both a-wave and b-wave, especially to the lower intensity stimulus. Notable in both abnormal recordings are the greater amplitudes of the broad tracing (left eye). This patient has vision in the right eye of 20/200, corrected; vision in the left eye, 20/50-1, corrected.

sharp peaks. The response to red light is weak, but fast and slow components are evident. In accordance with the clinical findings, the electroretinograms indicate that the right eye is more affected than the left.

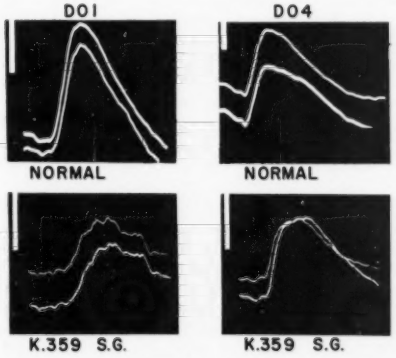


FIG. 12—Case 2 (K359). A comparision of low and moderate intensity stimuli in the dark, no filter (DO 1 and DO 4) reveals a definite reduction in both a- and b- components. This is especially notable in DO 4, for the amplification was doubled in the abnormal case. The tracing, left eye, is better in both recordings.

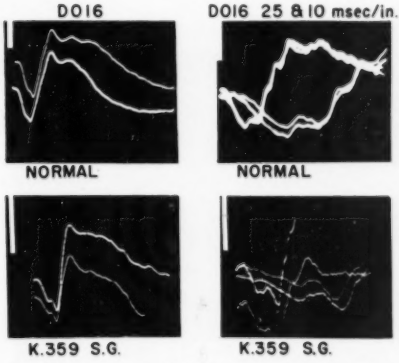


FIG. 13—Case 2 (K359). (Left side) DO 16, 50 msec./inch. There is definite reduction in amplitudes of both a-wave and b-wave, especially in the right eye (narrow stripe). (Right side) DO 16, 25 and 10 msec./inch. The components of both a-wave and b-wave are flattened as compared to the normal; n_1 is reduced, p_1 is flattened, and the p "humps" on the b-wave are flattened.

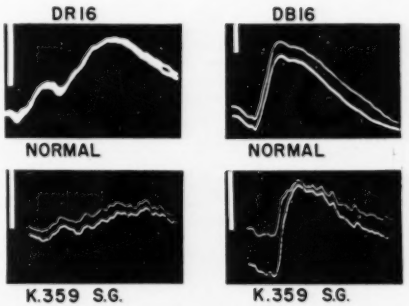


FIG. 14—Case 2 (K359). (Left side) DR 16. (Right side) DB 16. All response components are reduced in amplitude.

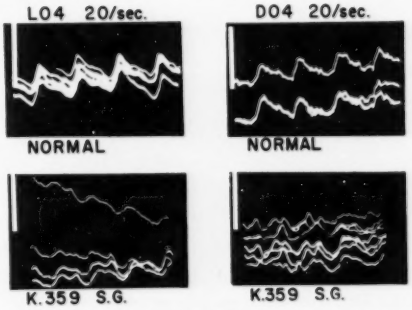


FIG. 15—Case 2 (K359). (Left side) LO 4, 20/second. (Right side) DO 4, 20/second. The lower left and right tracings indicate a marked change in the flicker response in the abnormal case.

The following case is an example of chorioretinitis involving the posterior central area of both eyes. Specific electroretinographic changes are more evident than in case 2.

Case 3

P. W. (K357), a 41-year-old white male, was first seen in the office of A. D. R., Jr., on May 21, 1956, because of active chorioretinitis in both eyes. Vision in the right eye was reduced to light perception and projection; in the left eye it was 18/20-3. The patient was hospitalized at that time and placed on Isoniazid and PAS therapy because of a positive tuberculin test. At that time he also

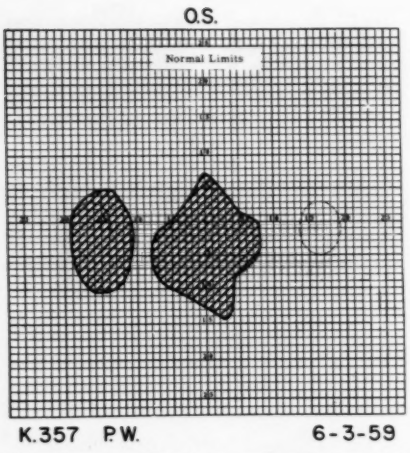
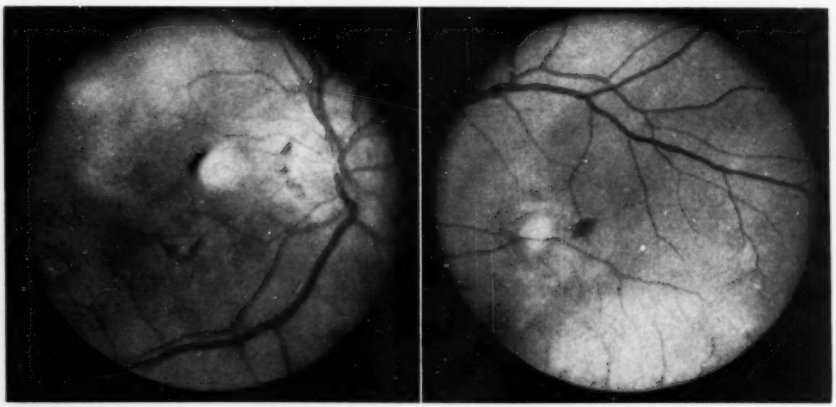


FIG. 16—Case 3 (K357). Central scotoma to 3/1000 white. The visual field of the right eye could not be obtained due to poor fixation.

received steroids. The chorioretinal lesions subsided, but in July 1958 he had an exacerbation, with a lesion above the macula in the left eye. He was placed on corticosteroids with some control, but there were intermittent exacerbations and remissions until February 11, 1959, when the patient was readmitted for another survey and possible therapy. ACTH therapy was not possible because of a previous psychoneurosis. The patient was again discharged on PAS and Isoniazid; he was also placed on maintenance steroid therapy. Family history was noncontributory to the diagnosis.

Eye Examination: The results of external examination are in the normal range. Visual fields: There has been a central scotoma in the left eye since December 1958 (fig. 16). The right eye has such poor fixation that an accurate determination is not possible. The ophthalmoscopic examination of the right eye reveals the media clear. There is an old chorioretinitis involving the nasal retina up and in from the disc (fig. 17). There is also an old chorioretinitis with pigment hyperplasia involving the macular area. There are no hemorrhages present, but the lesion has the appearance of an old hemorrhagic process. Ophthalmoscopic examination of the left eye reveals the media clear. There is a large lesion involving the nasal side of the retina which has a hemorrhagic fringe. The lesion appears to be primarily choroidal with retinal extension. In January 1958 a lesion slightly above and temporal to the macula was noted. This lesion was dark, raised, and had a hemorrhagic fringe. It did not appear to be active until July 1958. This lesion has increased in spite of all therapy until the present date. The macular area has been involved since late 1958, and vision has varied around 20/200. Vision in the right eye has remained less than 20/200 since 1956.

Electroretinographic examination (11/4/59): Both eyes are affected to about



A B

FIG. 17—Case 3 (K357). Fundus photographs show that the lesion in the right eye (A) is inactive, while in the left eye (B) the lesion is definitely active and, though supratemporal to the macula, it involves the macular area.

the same extent (figs. 18 to 22). Under all conditions and with all stimuli the electroretinogram is reduced in amplitude. Selective reductions concern the flicker response and the fast positive component of the response to red light stimulation. The flicker response is as severely affected as in case 1. Changes in the form of the a-wave described for case 1 are also evident, but to a considerably lesser degree. To date we have evaluated ten cases of chorioretinitis involving the central retina. All have similar electroretinographic changes.

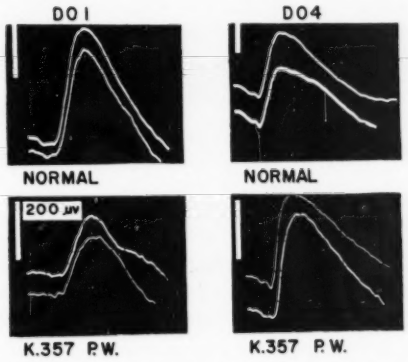


FIG. 18—Case 3 (K357). (Left side) DO 1. (Right side) DO 4. The comparison to the normal DO 1 reveals a reduction in a-wave and b-wave. This is also notable in DO 4 (amplification has been doubled in the afflicted case).

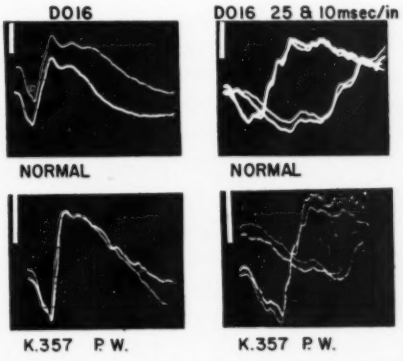


FIG. 19—Case 3 (K357). (Left side) DO 16. (Right side) DO 16, 25 and 10 msec./inch. The abnormal ERG shows an accentuation of n_2 in comparison to n_1. The changes in the a-wave are accentuated in the right side of the photograph, where it may be seen that the n_1 is flattened, as is p_1, the a_2 is accentuated. The "humps" on the b-wave are less evident.

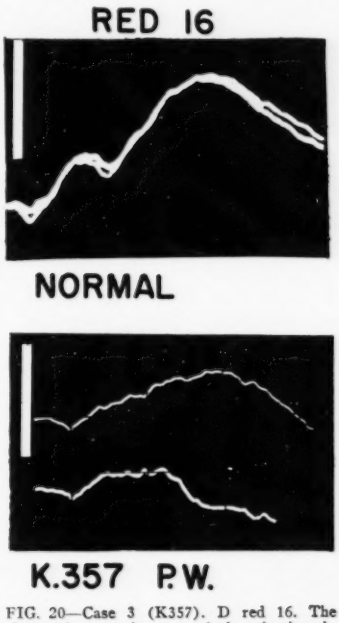


FIG. 20—Case 3 (K357). D red 16. The abnormal case shows marked reduction in the red response.

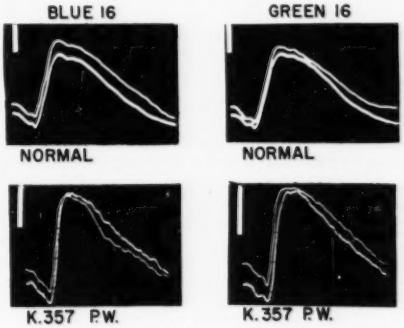


FIG. 21—Case 3 (K357). (Left side) D blue 16. (Right side) D green 16. The comparison to the normal reveals rather little change in the characteristics of the ERG, although amplitudes are reduced.

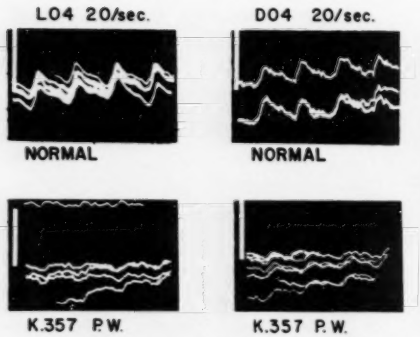


FIG. 22—Case 3 (K357). (Left side) LO 4, 20/second. (Right side) DO 4, 20/second. The response to a flicker at 20 per second reveals a marked reduction and flattening.

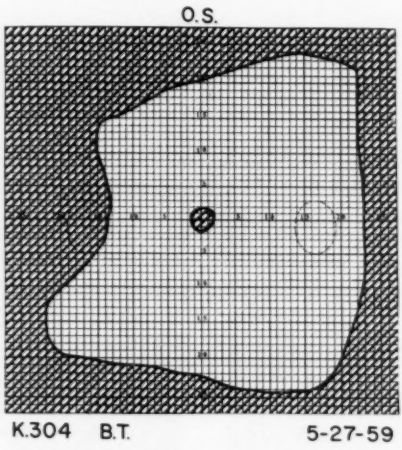


FIG. 23—Case 4 (K304). Central field, left eye. Central scotoma left eye to 1/1000 white. Central field of the right eye was normal.

The next case is an example of unilateral disciform degeneration of the macula.[14] The electroretinograms of both eyes are abnormal, but the affected eye is altered the most.

Case 4

B. T. (K304), a 60-year-old white male, was first seen in the office of A. D. R., Jr., on January 8, 1959, with a history of poor vision in the left eye following hemorrhage one year previously. Past Medical History: Tuberculosis 1937; no recurrence. Family History: Noncontributory to the diagnosis.

Eye Examination (5/27/59): Vision in the right eye is 20/20; in the left eye, 3/200. The external examination was negative. Visual fields show a central scotoma in the left eye (with poor fixation); right eye is within normal limits (fig. 23). The ophthalmoscopic examination of the right eye showed only a slight pigmentary change in the macular area. The examination of the left eye revealed the media to be clear. There were old hemorrhagic changes near the disc with neovascularization on the disc and some disc pallor. Old hemorrhagic changes and pigmentation were noted in the region of the macula (fig. 24).

Electroretinographic examination (6/17/59): Figures 25 to 29 show a marked difference in the electroretinograms of the two eyes. Those of the left eye are considerably lower and especially poor in the display of fast components. Although the b-wave of the left eye in response to a single stimulus in the dark is 200 microvolts, a measurable response to 20/sec. flicker is not elicited (fig. 29). The sharp peaks (p_2, p_3, p_4) superimposed upon the b-wave are missing (fig. 27, left eye, DO 16, 25 msec./inch) and p_1 is just barely visible (left eye, DO 16, 10 msec./inch). The response of the left eye to red light (fig. 28) shows only a slow wave; no fast component (x-wave) is distinguishable. The a-wave of the left eye is at least as much reduced as the b-wave but its form is not strikingly altered.

The electroretinograms of the right eye, though much higher than those of the left, are at the lower limits of normal. This is true of the b-wave in response to high and medium stimulus intensity (16, 4). The flicker and red light responses are below the normal range, and the fast positive components with DO 16 are less evident than in a normal subject. Only further examination will

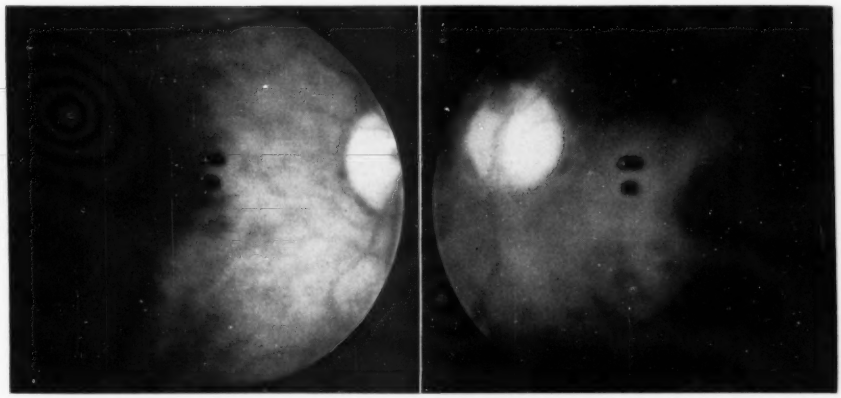


FIG. 24—Case 4 (K304). Fundus photo reveals a pigmented lesion in the macular area of the left eye. Pigmentation occurred following a central hemorrhage involving the macular area. The photograph is slightly blurred due to some clouding of the media.

tell whether the electroretinographic changes in the apparently unaffected eye are evidence that the disease process is not strictly unilateral.

This case is one in a series of eleven cases of disciform degeneration. All of the cases have similar defects in the electroretinograms, as shown by the left eye of this case. Undoubtedly the functional change is more widespread than the clinical picture would indicate. This patient has been re-examined recently. The right eye is still clear. The left eye has had further hemorrhage which completely blurs fundus details. The electroretinogram made at the re-examination is essentially the same as the one noted here.

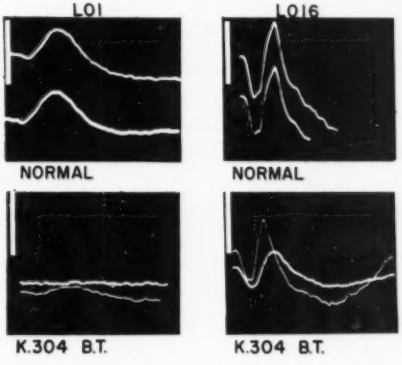


FIG. 25—Case 4 (K304). (Left side) LO 1. Broad line, left eye. Narrow line, right eye. Note that the left eye is more reduced than the right eye. (Right side) LO 16. The same changes are notable with increased stimulus.

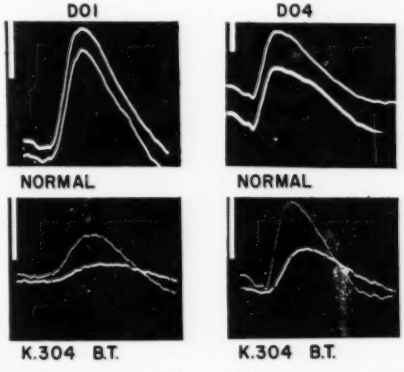


FIG. 26—Case 4 (K304). (Left side) DO 1. The response of the left eye is again more reduced than the right. (Right side) DO 4. The response from the left eye is abnormal and reduced while that from the right eye appears normal.

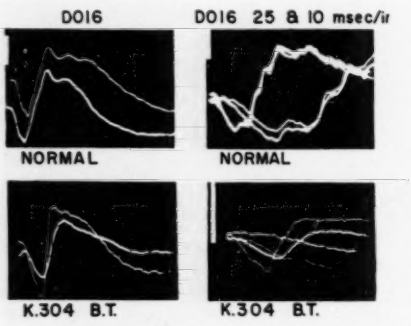


FIG. 27—Case 4 (K304). (Left side) DO 16, 50 msec./inch. The response from the afflicted left eye is abnormal and reduced. The response from the right eye is within normal limits. (Right side) DO 16, 25 and 10 msec./inch. With the faster sweep speeds, both eyes appear to be abnormal, the left much more than the right. N_1 is reduced, p_1 is flattened and n_2 is accentuated though the amplitude is reduced. The other p "humps" are so delayed in onset as to preclude differentiation.

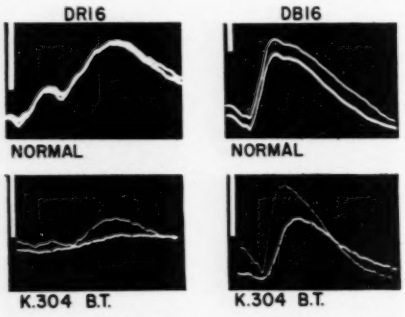


FIG. 28—Case 4 (K304). (Left side) DR 16. The response to red light is much more reduced in the left eye. (Right side) DB 16. The response for the right eye may be slightly reduced but has normal characteristics. The response from the left eye is abnormal and reduced.

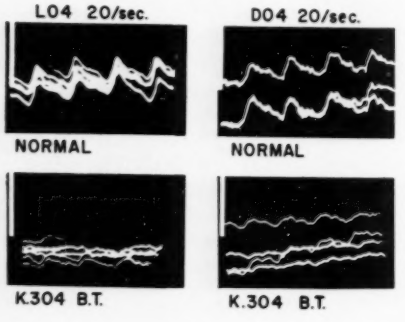


FIG. 29—Case 4 (K304). (Left side) LO 4, 20/second. (Right side) DO 4, 20/second. Both stimuli reveal a more marked reduction in flicker in the left eye. However, the right eye is markedly reduced as well.

The last case is that of a patient who was first seen with acute posterior central edema in one eye (macular hive). This case is included because no changes in the electroretinogram were noted approximately six weeks after onset.

Case 5

I. S. (K422), a 50-year-old white female, was first seen in the office of A. D. R., Jr., on April 26, 1960, with alteration in vision in the left eye for several weeks. There were previous ocular complaints. Past medical history and family history were noncontributory to the diagnosis.

Eye Examination: Vision in the right eye was 20/20; in the left eye, 20/100. The findings on external examination were within normal limits for both eyes. The central fields revealed no scotoma on repetitive testing (fig. 30). Ophthalmoscopic examination revealed the media clear; no lesion was seen. In the left eye the media was clear; a slightly raised edematous macular area with some pigment dispersion was noted (fig. 31). The patient was placed on ACTH therapy for ten days. At the end of this time vision had improved to 20/40 and the fundus appearance had markedly improved.

Electroretinographic examination (5/16/60): The electroretinogram appears to be within normal limits (figs. 32 to 36).

This case was included to show a small lesion limited to the macular zone with good vision retained. There is undoubtedly some damage to the central area with slight pigment changes and slight vision reduction. A central scotoma has not been elicited. There is apparently too little damage to the visual process to affect the electroretinogram.

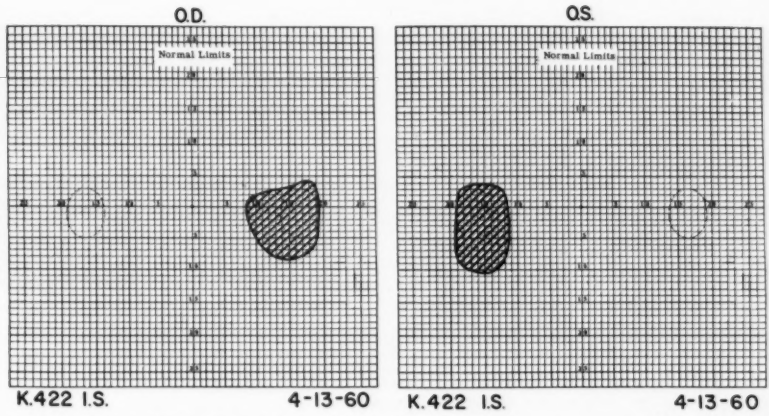


FIG. 30—Case 5 (K422). Central fields 1/1000, white, reveal no central scotoma, right or left.

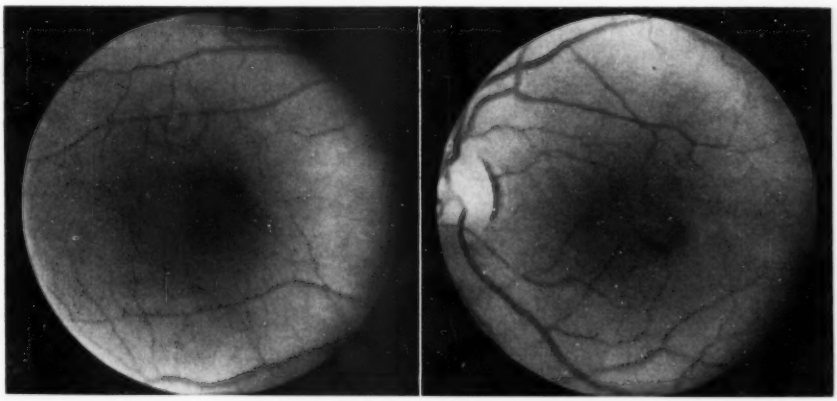


FIG. 31—Case 5 (K422). The fundus photo taken over a month after onset of present illness reveals some pigmentation in the macular zone. There is little if any of the macular edema present as noted in the original examination.

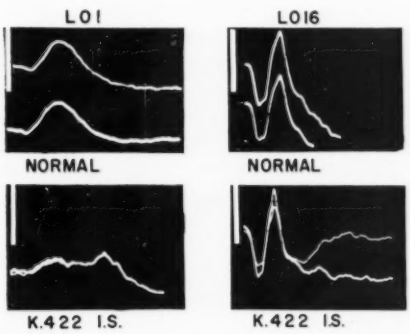


FIG. 32—Case 5 (K422). (Left side) LO 1. (Right side) LO 16. Responses are within normal limits for LO 16. The LO 1 might be slightly reduced.

DISCUSSION

The five cases presented in this paper have been selected from a series of over fifty cases of central retinal degeneration. Each case was drawn from a group of cases having similar clinical characteristics. The particular electroretino-

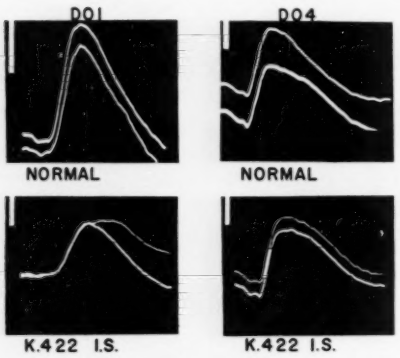


FIG. 33—Case 5 (K422). (Left side) DO 1. (Right side) DO 4. The response to both stimuli is within normal limits, right and left.

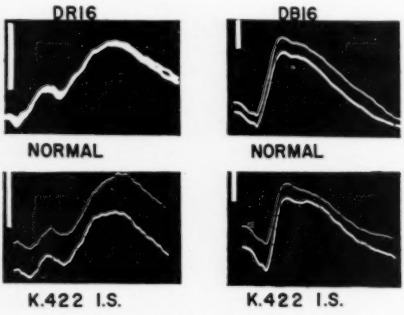


FIG. 35—Case 5 (K422). (Left side) D red 16. (Right side) D blue 16. The responses to both stimuli are within normal limits.

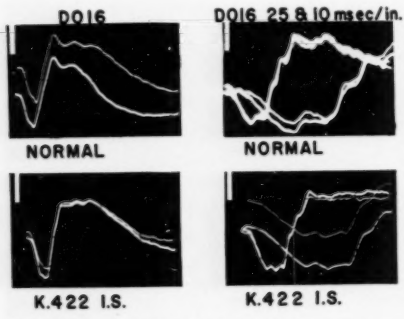


FIG. 34—Case 5 (K422). (Left side) DO 16, normal sweep speed. (Right side) DO 16, 25 and 10 msec./inch. The responses are within normal limits.

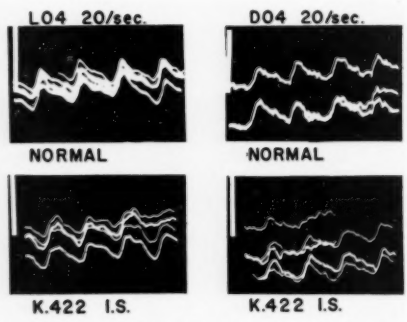


FIG. 36—Case 5 (K422). (Left side) LO 4, 20/second. (Right side) DO 4, 20/second. The responses in both cases are within normal limits.

graphic changes noted in each case (except case 5) are common to all the cases in that group; or, for that matter, to all of the cases of central retinal degeneration which have been studied in this laboratory. More specific variations in the clinical characteristics, as related to electroretinographic results, will be presented in separate publications. For the present, it is sufficient to note only that the most pronounced electroretinographic changes are noted in those disease processes which involve more than the macular and perimacular area; for example, senile and familial macular degeneration, and disciform degeneration of the macula.

The changes in the electroretinogram common to all the above noted cases of central retinal degeneration are as follows:

1. An over-all reduction in electroretinographic amplitudes and responsiveness.

2. Specific changes in the electroretinogram. They involve components which are fast compared to the b-wave. This is most evident in the reduction and blunting of the flicker responses.[3,4,5,6] It is apparent also in the slowing of the a-wave and its lack of normal differentiation. It is evident in the reduction of the fast cornea-positive wave, x-wave, in response to red light and in the poor development of the "humps" superimposed upon the rising phase of the b-wave. Somewhat similar findings, the reduction of the response to a red stimulus and the diminution of the a-wave have also been reported by others.[1,7]

In the commonly used vocabulary of clinical electroretinography these changes would be classified as indicating preferential involvement of the photopic components of the electroretinogram and would thus suggest involvement of the "cone" system. Although such a classification would agree with the failure of the central retinal function, it should be made with great caution. The complexity of retinal function and its manifestation by the electroretinogram actually do not permit such a simple interpretation unless it is supported by other evidence.[8]

The specific electroretinographic abnormalities are probably the most important ones, as they are most likely to yield information on the retinal functions, sensory or otherwise, and the retinal cells preferentially involved in these diseases. Because of the lack of knowledge of the origin of the electroretinogram, we can as yet not discuss these specific changes in terms of specific functions or structures—we can only report them.

Changes in the electroretinogram noted above specifically differentiate changes in central retinal disease from those primarily involving peripheral retinal elements; for example, retinitis pigmentosa, hereditary stationary night blindness.

In view of the fact that a-wave reduction and slowing is characteristically associated with structural changes of the visual cells as observed in animals, either following ingestion of certain poisons[10,11] or in hereditary degeneration of the visual cells of the mouse[14] or in rats[2] with a vitamin A deficiency, specific a-wave reduction suggests visual cell damage with possibly preferential involvement of the outer segments. However, whether or not all of the electroretinographic changes here reported are due to visual cell damage cannot be decided as yet.

Apart from considerations of the nature of central retinal diseases, which undoubtedly will be aided by further studies of the electroretinographic changes, the electroretinogram may assist the clinician in the following respects:

1. The differential between peripheral and central retinal disease as well as retinal and optic pathway disease.

2. The electroretinogram may indicate that the disease process is not strictly unilateral, though routine eye examination would indicate that only one eye is involved.

3. In familial degeneration, early electroretinographic examination might indicate the presence of a disease process heretofore unsuspected.

4. An objective test, such as the electroretinogram, is more reliable in the evaluation of therapy than tests depending upon the judgment of the patient. Repeated electroretinographic examination will yield objective evidence on the progress of the disease.

5. In any case, a technique which may

further the clinician's understanding of a disease should be utilized whenever possible.

SUMMARY

1. Cases of central retinal degeneration of varied pathogenesis have been presented. They were characterized by loss of central vision with associated central scotoma and fundus changes in one or both eyes.

2. In the cases with marked involvement of the posterior pole, the electroretinogram was reduced and showed, to a varying degree, specific alterations which indicate that certain electroretinographic components tend to be more affected in these diseases than others. These specific changes involved the a-wave, the fast components at the start and during the rise of the b-wave in response to strong stimulus, the fast positive ("x—") wave of the response to red light and the flicker responses. Reduction of the flicker response was the most obvious specific alteration.

3. The noted abnormalities give reason to propose that the electroretinogram should in the future be considered in the evaluation and study of central retinal diseases, to which the electroretinogram has not yet been properly applied due to past deficiencies in technique.

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DISCUSSION

JERRY HART JACOBSON, M.D., New York: It is a great privilege to be invited to discuss this excellent paper, and I wish to express my gratitude for this honor.

If I may, I should like to discuss briefly certain details of the physiology of the electroretinogram. The electrical phenomenon which we measure in this examination is, of course, a measure of the retinal functional integrity. As such, it contains elements which are due to the activity of the photopic as well as the scotopic retinal mechanisms.

Because the electroretinogram represents an evoked response, that is, a response to a stimulus applied to the eye, variation in the character of the response can be expected from alteration of any of the parameters of the stimulus, as well as the state of the retina itself.

The clinical significance of an objective determination of macular functional ability is apparent. For example, in a patient whose cataract precludes adequate visualization of the fundus with the ophthalmoscope, knowledge of whether a macular degeneration is present is of great importance.

Accordingly, for the past ten years numerous investigators have studied techniques for "uncovering," from the overwhelming and overlying peripheral elements of the electroretinogram, those elements which are presumed to be due to macular activity. This separation has been attempted on several bases. Limitation of the light stimulus to the macular area has been unsuccessful thus far, due to spread of the stimulus, probably both by reason of light scatter by the ocular media and by neuronal interconnections. Indeed, Asher has shown that stimulation of the optic disc will produce a very fine electroretinogram.

Other investigators, in attempting to differentiate the central response, have, in common with the essayists, utilized known differences in the physiology of the central area and the periphery. The macular area is almost entirely a cone, or photopic, system; thus, those differences in function which exist between the photopic and scotopic system may be expected to manifest themselves as differences in macular and peripheral function. Since we know that the cone system is more sensitive to the red end of the spectrum than the rods, long wavelength stimuli have been employed. Similarly, high frequency recurrent stimulation and the use of light adaptation have been used to emphasize the photopic components of the response.

On the basis of these techniques, as first outlined by Armington, Johnson and Riggs in 1951, the electroretinogram is conceived of as a dual reaction, with a fast first component of both the positive and the negative waves being probably due to photopic activity and a slower portion indicative of scotopic reactions.

There is, however, a problem, when we note that the photopic components seem absent in macular disease, as has been beautifully demonstrated here this morning, and as has been shown also by Jayle, Bessiere and Chabot and in our own laboratory.

Only somewhat less than 10 per cent of the total cone population of the human retina is within the macular area. Loss of this small proportion seems to produce an inordinately high degree of loss of the photopic elements of the electroretinogram.

In an attempt to elucidate this area, recently, we have destroyed the macula of a number of monkeys, using the light coagulator.

[Slide] This slide shows the electroretinogram of a normal monkey and the type of change due to increase of the scotopic portion of the response in the course of dark adaptation. This is similar to that demonstrated in humans by Auerbach and Burian, and is one of the bases for our concept of the photopic and scotopic components of the response.

[Slides] This slide shows the normal monkey fundus, and the next the lesion caused by the Meyer-Schwickerath device for photocoagulation. Serial electroretinograms made after this lesion was caused showed no change.

On this basis, we feel that the alteration in the human eye resulting from macular disease, as demonstrated by our authors with electroretinograms, are due to a lesion which must be sufficient to cause a widespread loss of photopic function. This is borne out by the marked choroidal sclerosis and retinal arterial narrowing seen in patient 1 (figs. 3 and 4), and the advanced age — 80 years — of another of the patients.

Interpretation of minor variations in electroretinogram must be very cautious. For example, if we study three of the normal tracings supplied by the authors, we will note a considerable degree of variation in them.

This degree of variation in records underlines the need for caution in interpretation of the convexity noted in the a-wave, especially since it is not present in all the cases presented. The use of superimposed numerous tracings rather than one single line might be helpful in eliminating artifact.

I should like to suggest that adaptometry, with emphasis upon the shape of the cone fraction of the curve, might also be of value in the workup of the patients.

In summary, I should like to congratulate the authors for a very fine demonstration of the type of alterations to be found in macular disease, and also for the demonstration of the aid to be derived by the practicing ophthalmologist from the electroretinograms.

DR. RUEDEMANN: I should like to thank Dr. Jacobson for discussing our paper. I would only like to say that the findings which we have noted in the laboratory certainly would indicate some variation in the normals.

We have tried to compensate for this by examining a large number of normals and statistically establishing a normal range. The normals we have used for comparison in the slides were all from different patients, and they were taken from the mean. We would not expect the same response to occur in every patient, so we evaluated all the abnormals in terms of the normal range.

We have found that for this particular group of cases the ERG changes are similar throughout; the changes occur for each stimulus intensity through the entire protocol.

THE SURGICAL MANAGEMENT OF SECONDARY EXOTROPIA

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DETROIT, MICHIGAN

EXPERIENCED ophthalmic surgeons know that the results of ocular muscle surgery are not always the same in practice as in theory. Although Wiener and Alvis,[24] Jameson,[14] Chavasse,[6] Gifford,[12] Peter,[19] Dunnington and Wheeler,[10] Gibson,[11] Wilkinson and Wilkinson,[25] and Sugar[21] have provided data regarding relationship between the extent of surgical correction in millimeters and the prism diopters of deviation corrected, most contemporary writers agree that the exact effect of operations on the extraocular muscles is for many reasons difficult to predict. The effect of a given operation will be greater in young patients than in older ones; greater in variable or intermittent deviations than in constant ones; greater in deviations of short duration than in those of long duration; greater in larger deviations than in smaller ones, and greater when the deviation disappears under deep anesthesia. Yet even with this knowledge we still must decide on the extent of surgical correction to be made on any given patient. Poor surgical judgment is only one cause of overcorrection or undercorrection. Other possible causes are faulty, inaccurate, or incomplete diagnosis; little understood innervational factors; faulty technique, and unsuspected or undiscovered anatomical abnormalities. Considering all these factors, it is not surprising that surgery for esotropia sometimes results in overcorrection. Burian[4] expressed the problem aptly when he said that the problems of ocular muscle surgery are not so much problems of technique as they are problems of judgment.

Not uncommonly one finds that while the deviation in certain patients with esotropia will first be improved by correction of a hyperopic refractive error, it later becomes divergent. The exotropia which develops without surgical intervention is referred to as consecutive exotropia. It may be due to the prescription of the patient's full hyperopic correction for so long a time as to prevent the development of relative fusional divergence; to a gradually increasing divergent position of the orbits; or to a gradually decreasing tonic convergence during growth. I classify such cases as exotropia with accommodative esotropia superimposed. These patients are esotropic without correction but with full correction they become exotropic as time passes. The accommodative esotropia is eliminated by correction of the refractive error, and the exotropia then gradually becomes manifest. Proper management of these cases requires that the refractive error be fully corrected by glasses and the exotropia be treated surgically. Once the exotropia has developed, treating them by reducing the hyperopic correction is ineffective; first, because such treatment is only temporary, and second, because the deviation is corrected usually only for one distance of gaze. Refractional overcorrection of pure accommodative esotropia can be prevented by reducing the plus correc-

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tion as fast as visual alignment will permit, before consecutive exotropia develops. Full correction of the refractive error over a long period of time prevents the normal development of relative fusional divergence. Reduction of the plus lens encourages relative fusional divergence to develop by permitting the patient to use the relative fusional divergence he already has. Thus, prompt and opportune reduction of the plus correction in accommodative esotropia may prevent the development of a consecutive exotropia. But it will not help once the exotropia has developed. The problem here is entirely different from that presented by those patients who develop exotropia as the result of surgery. In the latter instance the exotropia is referred to as secondary or postoperative exotropia, and it is with the surgical management of such cases that this paper deals.

Landolt and Koenig[17] considered a patient to be overcorrected if the change in the amount of deviation was more than 10 diopters in the opposite direction. This seems very generous. An overcorrection is an overcorrection whether it be 5 or 10 or 30 diopters, whether it is present in distance gaze, near gaze, or both. A small-angle secondary exotropia may become larger with time, and my opinion is that something should be done to correct it before this occurs, especially in cases in which there is a chance for a functional cure. Reducing the hyperopic correction may be of some temporary benefit and, in very small deviations, prisms may be incorporated in glasses as a trial. Usually further surgery is necessary. Whenever a secondary exotropia is very small, not cosmetically disfiguring, and occurs in a patient in whom there is no chance for a functional cure, a policy of watchful waiting may be adopted. It may be that the surgeon should leave well enough alone.

Landolt and Koenig[17] studied 630 patients operated upon for esotropia and concluded that the type of operation had a great deal to do with whether overcorrections occurred or not. Twenty-nine patients (4.6 per cent) showed a surgical overcorrection which required a secondary procedure. The authors felt that amblyopia of one eye did not play a significant part in producing overcorrection and came to no conclusions regarding the role of fusion status because of admitted inadequacy of records. In almost all cases in which a tenotomy or a recession of a medial rectus muscle had been done, reoperation revealed that the muscle was further behind the original insertion than would ordinarily be expected. Sometimes it was not found at all.

Tour,[23] in a discussion of overcorrection of esotropia, concluded that inadequate, careless, or variable preoperative evaluation was of little significance! He felt that practically all instances of overcorrection were due to an overenthusiastic surgical approach, meaning that too much had been done. Callahan[5] expressed the opinion that surgical overcorrection of ocular deviations usually results from improper selection of the original procedure or from too extensive an operation, or from postoperative adhesions. Dunnington and Regan,[9] in a review of the factors influencing operative results in comitant esotropia, studied 79 cases which had been followed for seven years. They concluded that overcorrection may be due to improper selection of the original procedure, too extensive an operation, or postoperative adhesions. Amblyopia and over 4 diopters of hyperopia tended to predispose the patients to a late overcorrection. Costenbader[7] and Knapp[15] both feel that ignoring or overlooking the presence of an "A" or a "V" phenomenon is a frequent cause of overcorrection.

From reviewing the literature one may conclude that while many factors play a part in producing overcorrection, the most important of these is overzealous surgical correction based on poor judgment or faulty diagnosis, or both. Retrospection reveals that in my hands overcorrection is usually the result of operating too soon or too generously. I do not believe that in my practice poor or inadequate diagnosis plays much part, and I feel that postoperative adhesions due to hemorrhage or excessive scar tissue are kept at a minimum.

All of us will agree that operations for esotropia should be planned with care. The decision as to the scope of the operation and as to which muscle or muscles should be included should be made only after a thorough diagnostic evaluation and consideration of all the factors which might influence the result. Unfortunately, postoperative exotropia does not always receive the same careful consideration as that accorded the original esotropia.

Costenbader[8] refers to the management of overcorrection, saying only that proportionately more surgery is necessary to restore a postoperative deviation than was performed in the first instance. Brown concluded that re-operation on the same muscle to correct an overcorrection will require more extensive surgery than was originally necessary to correct the same degree of deviation,[2] and he implied that previously recessed muscles should be advanced.[3] Dunnington and Regan[9] feel that the exact treatment of an overcorrection can be decided upon only after the previously operated muscle has been examined to determine the presence of scar tissue. If none is found, they agree that more surgery is necessary to correct the secondary deviation, usually re-operation on the same muscles. Lyle and Bridgeman[18] say that when a deviation has been overcorrected at the original operation, a subsequent operation has to be more extensive; that an advancement of a recessed medial rectus muscle back to its original insertion will be necessary, and that sometimes this should be accompanied by a recession of the antagonist lateral rectus muscle as well; but they do not provide the criteria for making this decision. Gifford[13] recommended that when correcting an overcorrection, the second operation should be on the muscles previously operated upon. Knapp[16] says that most writers give the impression that much more surgery is necessary to correct exotropia which follows surgery for esotropia than was necessary to produce it, but he claims that this is not always true and points out that the conditions found at re-operation will dictate how much to do. In any case, he concludes that it is necessary to *undo what was done*, and sometimes a second operation must be more extensive than the first. Callahan[5] says an operation to correct an overcorrection has to be more extensive than the original one. Scobee[20] devoted several paragraphs to overcorrection but did not add to the comments of authors cited above.

Almost all references to the management of secondary exotropia in the literature are limited to an admonition that the secondary operation should attempt to undo what was done at the first operation and that the secondary operation usually must be more extensive. Such a dictum is not reasonable. When surgical intervention is necessary to correct secondary exotropia, it should be planned carefully in relation to a new diagnostic evaluation.

Sugar[22] discussed overcorrection of exotropia but not of esotropia. He found that overcorrection of an intermittent exotropia of the divergence excess type frequently takes the form of an esotropia of the convergence excess type. He

suggested, therefore, that a recession of the medial rectus muscle should be done rather than advancement of the previously recessed lateral rectus muscle. This gave me the first clue to what I now feel is the proper management of secondary exotropia. Breinin[1] has shown that divergence is an active process. The terms "divergence excess" and "divergence insufficiency" now have more meaning than they had previously, since one could hardly speak factually of an excessive or insufficient divergence if there were no divergence innervation. We may assume that under normal conditions at any given moment the response to tonic divergence innervation and the response to tonic convergence innervation balance each other and, other things being normal, this results in orthophoria. In cases in which there is an excessive or insufficient tonic convergence, the findings would be greater in near vision, since convergence is a function of near vision. Some patients with nonaccommodative esotropia have an excessive tonic convergence resulting in convergence of the visual axes, especially in near gaze. My usual procedure in such cases has been to do a recession of one or both medial rectus muscles to correct the nonaccommodative portion of the

TABLE I

SECONDARY (POSTOPERATIVE) EXOTROPIA

TYPE OF SURGERY	NO. OF PATIENTS	OVERCORRECTIONS	
		NUMBER	PER CENT
Symmetrical			
Bilateral Recession Medial Rectus	187	15	8.0
Bilateral Resection Lateral Rectus	24	2	8.3
Bilateral Recession-Resection	35	2	5.7
Total Symmetrical	246	19	7.7
Nonsymmetrical			
Recession Medial Rectus one eye	67	7	10.4
Resection Lateral Rectus one eye	56	2	3.6
Recession-Resection one eye	112	6	5.4
Bilateral Recession Medial Rectus and Resection Lateral Rectus one eye	65	4	6.1
Bilateral Resection Lateral Rectus and Recession Medial Rectus one eye	16	1	6.2
Total Nonsymmetrical	316	20	6.3
TOTAL	562	39	6.9

esotropia. If this procedure corrects but does not overcorrect the convergence excess, I would expect a good surgical result for both distance and near. However, if the operation overcorrects the convergence excess, it could then be expected that the response to tonic divergence would now be relatively excessive and the result would be an exotropia greater for distance than near. A study of my records shows a number of such cases, and I hope to show that advancing the previously recessed medial rectus muscle or muscles in these cases is not the proper approach to the problem.

I have analyzed a series of 562 cases of comitant esotropia operated upon between July 1, 1945, and January 1, 1960, to determine the incidence and clinical characteristics of overcorrection. Overcorrection is defined, for purposes of this paper, as a deviation in the opposite direction of 5 diopters or more for either distance or near gaze which persisted at least one month. Patients who previously had been under the care of another surgeon and those who could not be followed for at least six months after the last operation were excluded. Using these criteria, 39 patients (6.9 per cent) were found to have developed overcorrection (table I). The occurrence of secondary exotropia following symmetrical surgery and that following nonsymmmetrical surgery were practically the same. Overcorrection occurred in 7.7 per cent of the patients who had symmetrical surgery for esotropia, and in 6.3 per cent of those who had nonsymmetrical surgery.

Table II shows the interval between the last operation performed for esotropia and the development of secondary exotropia. Nearly one half of the overcorrections developed one year or more after the last operation for esotropia.

TABLE II

SECONDARY (POSTOPERATIVE) EXOTROPIA

Number of patients	39
Onset within 3 months	13
Onset from 3 to 12 months	8
Onset after 12 months	18

When an overcorrection develops a year or more after an operation for esotropia, it may be consecutive rather than secondary but this distinction is hard to make. For this reason I have included all patients who developed exotropia following surgery for esotropia.

The clinical characteristics of 39 patients with overcorrection are interesting (table III). Twenty-six patients showed a secondary exotropia greater on distance measurement than on near measurement. They showed no evidence of poor convergence or weakness of the medial rectus muscles in spite of the fact that the medial rectus muscle had been recessed on one or both eyes in all but one of the patients. On the other hand, 8 patients developed a secondary exotropia of the convergence insufficiency type, measuring greater for near gaze than for distance. All but one of these patients had had a recession of one or both medial rectus muscles, and most showed poor convergence and some incomitance. Five patients showed a secondary exotropia measuring the same for both distance and near gaze.

It is apparent that overcorrection of esotropia is more apt to occur as a result of recessing the medial rectus muscles, whether combined with a shortening procedure on the lateral rectus muscles or not. Only 4 patients in the whole series developed a secondary exotropia

TABLE III

SECONDARY (POSTOPERATIVE) EXOTROPIA

TYPE OF SURGERY	TOTAL NO.	DEVIATION GREATER ON DISTANCE MEASUREMENT (DIVERGENCE EXCESS)	DEVIATION GREATER ON NEAR MEASUREMENT (CONVERGENCE INSUFFICIENCY)	DEVIATION SAME DISTANCE AND NEAR
Bilateral Recession Medial Rectus	15	10	4	1
Bilateral Resection Lateral Rectus	2	—	1	1
Bilateral Recession Resection	2	—	—	2
Recession Medial Rectus one eye	7	6	1	—
Resection Lateral Rectus one eye	2	1	—	1
Recession Resection one eye	6	6	—	—
Bilateral Recession Medial Rectus Resection Lateral Rectus one eye	4	2	2	—
Bilateral Resection Lateral Rectus Recession Medial Rectus one eye	1	1	—	—
TOTAL	39	26	8	5

from shortening procedures on the lateral rectus muscles alone.

It is also apparent that overcorrections may show different clinical characteristics and cannot all be managed in the same way. Cases 1 and 2 demonstrate this.

Case 1—D. S., 8 years old

October 1954
+1.25=20/20 sc ET 12
+1.75=20/60 ET′ 10
n.p.c. 120 mm. Rx: Occlusion

February 1955
sc 20/20 Rx +1.00 sc ET 8
20/25 +1.50 ET′ 10
Continue occlusion

June 1955
cc 20/20 ET 10 A.R.C.
20/25 ET′ 10

July 1955
Recession left medial rectus

January 1956
cc 20/20 ET 2 X′ 3 ←→ ET′ 16
20/25 E′ 2
A.R.C. Further occlusion, 2 months
Orthoptic training, 2 months

August 1958
cc 20/20 ET 2
20/30 XT′ 3

December 1958
sc 20/20 XT 8 XT′ 30 ←→ XT′ 10
20/25 XT′ 25

April 1959
Advancement of left medial rectus to insertion and resection.

May 1960
sc 20/20 RH 2
20/25 X′ 8 RH′ 2
No incomitance
Worth 4-dot—Suppression, left eye

Comment: The patient had some incomitance after a recession of one medial rectus muscle and gradually developed a secondary exotropia of the convergence insufficiency type. An advancement of the recessed medial rectus muscle resulted in a satisfactory cosmetic cure.

Case 2—J. M., 7 years old

September 1955
ET 30
ET′ 50 Amblyopia of left eye. Occlusion.

November 1955
20/20 ou. Glasses +1.50 ou.

December 1955
cc ET 25
ET′ 35

January 1956
Bilateral recession of medial rectus

June 1956
20/20 XT 18
20/30 X′ 10
Advancement of right medial rectus. No improvement.

November 1956
XT 18
X′ 10

March 1957
Recession of left lateral rectus

December 1957
X 2
X′ 4 Fusion

January 1960
20/20 ET 2
20/20-2 ET′ 2 Peripheral fusion

Comment: This patient developed secondary exotropia after a bilateral medial rectus muscle recession. The secondary exotropia was of the divergence excess type. An advancement of one medial rectus muscle failed to improve the condition but a recession of one lateral rectus muscle resulted in an excellent and lasting result.

When a patient with secondary exotropia is examined and the deviation is found to be of the convergence insufficiency type, measuring greater for near than for distance, advancement of a recessed medial rectus muscle is the operation of choice. If both medial rectus muscles have been recessed and the secondary exotropia is large, both should be advanced. If the deviation is small, only one medial rectus muscle should be advanced. If there is incomitance, first attention should be paid to the medial rectus muscle acting in the field where the exotropia is greatest. Usually advancement of a previously recessed medial rectus muscle must be liberal. The danger of restoring the original esotropia is remote. In my series, one patient developed a convergence insufficiency type of secondary exotropia following a bilateral resection of the lateral rectus muscles. In this patient the deviation was small and further corrective surgery was not attempted. Unless the deviation were large, I would not be inclined to advise medial rectus muscle surgery in such a patient; but if the deviation were large, I would not hesitate.

Case 3—T. S., 4 years old

July 1950
sc 20/400 ET 40
20/30 ET′ 40
Rx +3.75
+2.00 Occlusion of the left eye

February 1951
cc 20/40 ET 14
20/30 ET′ 25
Bilateral recession of the medial rectus

March 1951
XT 8
XT′ 10 Orthoptic exercises for 2 months

December 1951
cc X (T) sc orthophoria
XT′ 6 XT′ 5
n.p.c. remote

October 1952
Advancement of right medial rectus

December 1952
Orthophoria, E′ — X′
20/25 Further orthoptic exercises
20/20

December 1953
XT 12
XT′ 10

June 1954
20/60 XT 15
20/20 XT′ 15 Amblyopia recurring
Advancement of left medial rectus

October 1954
XT 8
XT′ 15 n.p.c. still remote

November 1957
20/40 XT 15
20/20 XT' 20 Little chance for fusion.

May 1958
sc 20/30 XT 12 Crossed diplopia on Worth dots
20/30 XT' 15

Comment: Should now have further resection of one medial rectus muscle. This is a good example of a case which requires advancement of a recessed medial rectus and which proves the often repeated dictum that a secondary operation should be more extensive than the original one.

Case 4—T. F., 5 years old

April 1951
cc +1.50 20/30 ET 20
+1.50 20/60 ET' 25
n.p.c. 20 mm.
Overaction of inferior oblique, each eye
Occlusion of the right eye

June 1951
cc ET 12
ET' 30 Recession of left medial rectus

August 1951
cc ET 14 20/30
ET' 20 20/40 Recession of right medial rectus

September 1951
20/30 ET 5
20/40 ET' 5

February 1952
XT 20 n.p.c. Remote
XT' 25

July 1952
Advancement of left medial rectus to insertion

October 1952
20/20 XT 4 20/20 Occlusion of the right eye
20/50 X(T)' 8 20/50 Leave glasses off

April 1953
sc ET 4
E' 4 Orthoptics 2 months

April 1955
20/20 ET 4 Claims fusion on Worth dots
20/30 E'—0

June 1957
—1.00 20/20 Fuses at distance and near
—1.00 20/30

May 1960
cc —1.50 —0.25 x 180=20/15
—2.25 =20/20
Maddox rod E3
X' 2
Fuses Worth dots
No stereopsis

Comment: A secondary exotropia of the convergence insufficiency type developed after recession of both medial rectus muscles. Advancing one medial rectus muscle restored the eyes to near parallelism. Orthoptic exercises and a gradual reduction in the amount of hyperopia resulted in a satisfactory functional result.

Case 5—T. B., 3 years old

October 1954
20/30 ET 18
20/30 ET' 25. No glasses.

November 1954
Recession of right medial rectus

February 1955
Recession of left medial rectus

March 1955
E 2
E' 6 n.p.c. 80

May 1955
20/30 X3
20/30 X' 4

May 1956
XT 20
X' 10

August 1956
Recession of left lateral rectus

October 1956
X6 n.p.c. 80
X-E'
Orthoptics

April 1958
20/20
20/20
Fuses Worth dots at distance and near
Maddox rod X-1
X-2

Comment: A secondary esotropia of the divergence excess type resulted one year after both medial rectus muscles were recessed. A recession of the lateral rectus muscle was indicated and resulted in a functional cure.

It is interesting that two thirds of the patients with secondary exotropia showed a deviation of the divergence excess type, being greater when measured in distance gaze. Such patients should receive the same treatment as those who

have a primary divergence excess type of deviation. One or both lateral rectus muscles should be recessed regardless of what the primary operation may have been, especially if convergence at near is good.

Case 6—P. T., 5 years old

September 1953
+2.75+0.50x90=20/40
+1.25 =20/20
cc ET 16
ET′ 26 A.R.C. Occlusion of the left eye

March 1954
cc 20/20 ET 6
20/20 ET′ 20
Rx Bifocals

May 1954
cc ET 10
ET′ (Bifocals) 10
Recession of the right medial rectus; three weeks of orthoptic exercises

June 1954
XT 20
E′ 6 Reduce glasses E 6 ←→ XT 20

September 1954
sc ET 6 cc XT 20
ET′ 10 E′ 6
Advancement of right medial rectus

June 1956
XT 25
E′ 2

October 1956
XT 25
X′ 15
Recession of right lateral rectus

January 1957
X 8
E′ 5 Fused Worth 4-dots, n.p.c. 80 mm.

September 1958
Wearing +2.50 +0.25 x 105
plano
cc XT—12
X(T)′ 20 n.p.c. 70 mm. Recession of left lateral rectus

October 1958
X 5
E′—X′
Homonymous diplopia, Worth dots

May 1960
cc 20/20 E 4 Peripheral fusion
20/20 E(T) 6 15 per cent stereopsis
Should have orthoptic training

Comment: A recession of one medial rectus muscle resulted in a secondary exotropia for distance. Advancement of the recessed medial rectus muscle did not help. A fair fusional result was obtained by recessing one lateral rectus muscle two years after onset of exotropia. It was finally necessary to recess the other lateral rectus muscle also. This patient might have developed exotropia even without any surgery for esotropia.

Case 7—L. M., 3 years old

December 1951
+1.00 +1.25 x 90 ET
+1.00 +1.25 x 90 ET′ Glasses prescribed
Fixation of left eye poor. Occlusion of right eye begun and within two weeks switched fixation preference.

February 1952
20/40 E 3
20/40 ET′ 30 Bifocals prescribed

September 1953
ET 8
ET′ 30 c bifocals ET′ 20. Recession of right medial rectus.

November 1954
20/30 X(T) 20
20/30 E′ 10. Recession of right lateral rectus.

November 1958
cc 20/15 X 15 Fusion distance and near
20/20 E′ 2

September 1959
cc —0.25 +2.00 x 95=20/15 cc X 20
—1.00 +1.50 x 80=20/20 E′ 2
Worth Fusion. X(T) outdoors in bright light

June 1960
cc 20/20 X 20
20/20 E′ 4
Stereopsis 15 per cent

July 1960
Recession of left lateral rectus

August 1960
cc 20/20 X 3
20/20 E′ 4
Fuses Worth dots

Comment: This case is similar to Case 6. Secondary exotropia followed a recession of one medial rectus muscle. A recession of one lateral rectus muscle was indicated and resulted in functional cure, but after five years it was necessary to recess the other lateral rectus muscle.

Case 8—G. T., 2 years, 6 months old

October 1953
20/100 ET 14 No glasses necessary
20/30 ET′ 16 Occlusion of left eye

December 1953
Recession of right medial rectus

January 1954
ET 12
ET′ 15

March 1954
20/40 ET 8 n.p.c. 30 mm.
20/30 ET′ 20 Recession of left medial rectus

June 1955
20/30 X 3 Fused Worth's dots
20/30 X′ 4 n.p.c. 40 mm.

June 1956
20/30 XT 10
20/30 X′ 3

March 1957
20/20 XT 16
20/20 X′ 4 Recession of right lateral rectus

December 1957
20/20 X = 6
20/20 X′ = 0 Fuses at distance and near

December 1958
20/30 X=5
20/30 X′=0 Fusion at distance and near

April 1960
20/25 Ortho on Accommodative targets
20/20 Ortho′ on Accommodative targets
Wirt Stereopsis 50 per cent

Comment: A recession of both medial rectus muscles for esotropia resulted in a good result for twelve months. Subsequently a divergence excess type of secondary exotropia developed which was cured functionally and permanently by recession of one lateral rectus muscle.

Case 9—J. M., 12 years old

August 1948
Cerebral palsy
—0.75 = 20/20 ET 6
—0.75 = 20/70 ET′ 12 Occlusion of right eye

November 1948
20/20
20/30 Good second-grade fusion with fair amplitude

September 1949
Recession of left medial rectus. Incomitance

April 1950
Recession of right medial rectus. Incomitance disappeared

July 1950
XT 20
E′—X′

December 1953
—2.25 — 0.75 x 180 = 20/20 XT 15
—2.50 — 1.00 x 5 = 20/25 X′ 2 Recession of left lateral rectus

April 1957
E 2
E′ 8 and was able to fuse at distance and near

March 1958
20/20 E(T) 4 Intermittent fusion
20/30 E(T)′ 8
Not capable of orthoptics

Comment: An example of secondary exotropia similar to Case 8.

Case 10—S. V., 2 years old

April 1949
ET 40 +6.00 +2.25 x 90 = 20/20
ET′ 60 +7.00 +1.75 x 95 = 20/40

June 1951
cc ET 16
ET′ 25 Recession of left medial rectus

February 1952
E 5
ET′ 12 No incomitance

September 1955
20/20 XT 12
20/30 X′ 2 Recession of left lateral rectus

February 1957
20/20 x 2
20/30 X′ 2
Able to fuse Worth dots at distance and near. Second-grade fusion with poor amplitude

March 1958
cc E 2 n.p.c. 85 mm.
X′ 7 Fuses Worth dots at distance and near

October 1958
20/15 Maddox rod X2 X′ 8
20/15 Fuses Worth dots. Poor amplitude
Three weeks of orthoptic training

March 1960
cc +4.00 +2.00 x 86 = 20/20
+5.00 +2.00 x 104 = 20/20
X = 4
X′ = 3 LH′ 2
Reduce sphere 1.00 D=E3
E′ 3 Fuses Worth dots

Case 11—L. B., 13 months old

January 1953
Rt. ET c eccentric fixation of right eye
ET′ 60 (Krimsky). Occlusion of left eye
Refraction +1.00 ou

February 1953

Left ET. Good fixation with right eye.

March 1953
ET′ 50. Alternate fixation. Recession of left medial rectus

June 1953
E(T)′ 40

September 1953
ET′ 30

January 1954
Recession of right medial rectus

May 1956
20/30 X 6
20/40 X′ 8—10 n.p.c. good

January 1957
XT 15
X′ 10

June 1957
XT 15
X′ 15 Recession of left lateral rectus

July 1957
E3
E3 (variable)
Fuses Worth 4 dots at distance and near.
Double H.

April 1959
E(T) 8⟩
E(T)′ 10⟩ Double dissociated hyperphoria

August 1960
sc 20/20 E 4 D.H.
20/20 E′ 8 D.H.
Stereopsis 30 per cent
Fuses Worth dots

Case 12—R. B., 3 years old

September 1953
+1.75 = 20/20—
+2.00 = 20/30

January 1954
cc ET 45
ET′ 50
Bilateral recession of the medial rectus

September 1954
sc 20/20 E 3
20/30 E′ 6 n.p.c. 65

February 1956
20/20 X 5
20/30 X′ 5
Fuses Worth dots. Suppression of left eye on troposcope. Orthoptic exercises

January 1957
20/20 X(T) 10 Out window XT 20
20/30 X′ 4

November 1957
Recession of left lateral rectus

January 1958
20/20 E-X
20/20 E′ 4
Fuses Worth dots at distance and near
Maddox rod E7 E′ 9

May 1959
20/20 E 2 RH 2
20/20 E′ 5 RH 2
Fuses Worth dots—good amplitudes
Slight X in lateral versions.

The results of a carefully planned surgical procedure for secondary exotropia are gratifying. Although I have not made a statistical analysis of the results and compared them with over-all results in the whole series of 566 patients, I have the sure impression that the functional results are at least as good, and perhaps better, as in the over-all group. It seems that when an overcorrection is properly corrected, binocularity frequently follows. This is especially true of those overcorrections which take the form of a divergence excess type of exotropia, and I no longer feel dismayed when it occurs. Some of these patients have had all four horizontal rectus muscles recessed with good functional results, and complications, such as exophthalmos, have not occurred. There has been only one instance in which the overcorrection was overcorrected. This patient refused further surgery.

Whenever an overcorrection results from ocular muscle surgery, the case should be re-evaluated on the basis of the diagnostic findings determined following the last operation. It is inadvisable to assume the attitude that one should undo some of the surgery which has been done. The interval which is allowed to elapse between the onset and the repair of secondary exotropia merits consideration. No hard and fast rule can be laid down, but the second operation should not be delayed so long that the patient adapts abnormally to the

new position. On the other hand, the surgeon should not be panicked into operating too quickly, since an overcorrection which is apparent a day or two after an operation sometimes disappears. In general, if secondary exotropia following a medial rectus recession is associated with incomitance, re-operation should be done promptly, advancing the previously recessed medial rectus. When there is no incomitance and the exotropia gradually increases, one may delay until the increase ceases, inasmuch as abnormal sensory adaptations are less apt to occur when the deviation is changing or variable. When the secondary exotropia becomes constant, further delay is not permissible. The surgeon should plan his approach to the new problem just as though there had been no previous surgery. It is frequently possible to correct an overcorrection by an attack on muscles not previously operated upon.

SUMMARY

Secondary or postoperative exotropia may occur as a complication of surgery for esotropia in spite of careful planning. The incidence of surgical overcorrection of esotropia may be reduced by thorough preoperative diagnostic evaluation and consideration of all the factors which may influence the result. Nowhere is experience more important than here. When secondary exotropia does occur, the surgeon should evaluate it carefully and base his decision as to what to do on the clinical findings *at that time*. The idea that surgery for secondary exotropia should always undo what was previously done should be rejected.

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DISCUSSION

RUDOLF AEBLI, M.D., New York: Dr. Cooper has presented a timely and candid paper on the surgical management of secondary exotropia. All of us at some time have had similar experiences, and as we follow our cases down through the years and see these patients ten to fifteen years later, especially after adolescence, the frequent occurrence of divergence of the eyes which have been surgically treated has sobering effect, tending to make us more and more conservative in our recession procedures on the internal rectus muscles.

Dr. Cooper reports on a series of 562 cases on which he operated from 1945 to 1960 and in which he had only 39 cases of overcorrection. He is to be congratulated on such good results. It is my impression that if these patients should be followed over a longer period of time through the adolescent years, his cases of secondary exotropia would be considerably higher.

Dr. Cooper postulates that normally in orthophoric eyes the tonic convergence and the tonic divergence are in balance and that in cases of secondary exotropia this balance for various and sundry reasons is disturbed. In 26 cases the exotropia was greater for distance than for near, and most of these patients showed no evidence of poor convergence ability or weakness of the previously recessed internal recti. He states that these are secondary cases of divergence excess and that one or both lateral recti should be recessed. However, in eight of the twelve cases of overcorrection which he presents in detail in the paper, it was necessary to "undo what was done," namely, to strengthen one or both of the previously recessed internal rectus muscles.

Dr. Cooper concludes that the results of carefully planned surgery performed for secondary exotropia are gratifying. This is not my experience. Adhesions, secondary contractures, muscle fibrosis, secondary deviations and abnormal conjugate movements make these operations more difficult and the results far from satisfying.

Dr. Cooper has reviewed the literature and has presented a well prepared paper emphasizing the importance of careful preoperative and postoperative analysis and the importance of re-evaluation of the case on the basis of diagnostic findings following the overcorrection. He has contributed some important diagnostic principles in the handling of secondary exotropic cases.

In closing, I wish to emphasize that muscle surgery is not a simple innocuous procedure and that in early childhood it is inadvisable to recede the internal recti more than 3.5 to 4 millimeters. Conservative muscle surgery is less likely to end in disappointment in later years.

DR. COOPER: I wish to thank Dr. Aebli for his remarks. I am quite pleased to learn that 8 per cent overcorrections in his opinion is a small figure. I had felt that an incidence of 8 per cent was quite high.

I would like to point out that no one should leave this room with the idea that I said one should never undo what was done. I feel that one cannot decide whether to undo what was done or to do something different until he has

made a proper diagnostic evaluation following the first operation.

In some instances, undoing what was done will be found to be indicated. In other cases, very strong evidence will point to the fact that undoing what was done is contraindicated, and one cannot lay down rules about taking care of secondary exotropia any more than one can say flatly that all cases of strabismus should have a certain regimen or routine care.

A follow-up of six months probably is too short, and I have no doubt but that Dr. Aebli is correct when he says that some of these patients who have not already done so may yet develop exotropia, and some of the ones who have developed exotropia which I have corrected may still develop it again. A follow-up of six months might be as good as any, and one might say even two years is not a long enough follow-up under certain circumstances.

I have been rather unhappy with the terminology "secondary exotropia" in this paper. "Secondary exotropia" is not a particularly good term, since it could be confused with a secondary deviation of paralytic strabismus. It might mean an operation for undercorrection as well as an operation for overcorrection. "Postoperative exotropia" may be a better term, but it still does not further describe the condition we are discussing. An exotropia which is undercorrected could be referred to as "postoperative," as well as an esotropia which is overcorrected. The best term is "overcorrection," and no one can doubt what is meant by it.

The biggest problem facing the surgeon in the management of overcorrection is to persuade the patient or parents of the patient that further surgical intervention should be permitted. As I said, this is easier if the patient and the parents are prepared properly. It is always nice to be able to discuss overcorrection with a certain amount of nonchalance with the parents. Nonchalance may be said to be the ability to look like an owl when your results seem to show that you acted like a jackass.

NEVOXANTHOENDOTHELIOMA (JUVENILE XANTHOGRANULOMA) OF THE IRIS

Diagnosis by Biopsy and Treatment with X-rays

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THE patient, a 6-month-old white girl, was first seen November 3, 1958. Three weeks previously the parents had noticed a yellow spot on the left iris. A few days later, fresh blood was seen on the iris. This bleeding recurred four days prior to examination. The past medical history of the child contributed nothing of significance to the diagnosis. However, the birth of the child had been slightly premature. The birth weight was five pounds, and three ounces.

Examination revealed a yellowish-pink mass over the peripheral portion of the left iris from three to six o'clock (fig. 1). Coagulated blood was present on the surface of the lesion .The adjacent iris was vascular and slightly greenish in color. Moderate corneal edema permitted a hazy view of an apparently normal fundus. Intraocular tension measured 27 mm. Hg (Schiøtz 1955). Gonioscopy showed flocculent tumor tissue spread along the angle, over the surface of the lens, and on the back of the cornea. The right eye appeared to be completely normal and there were no skin lesions.

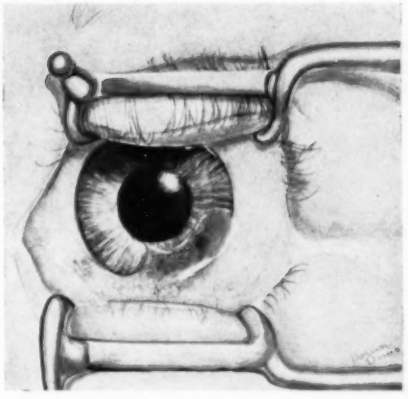

FIG. 1—Nevoxanthoendothelioma of the iris. November 3, 1958.

Iris biopsy was performed through a small limbal incision at the six o'clock position. The excised tissue was friable and there was considerable bleeding from the wound. Histologic study showed the iris to be diffusely infiltrated with large histiocytic cells. Numerous large thin-walled vessels were present (figs. 2 and 3). The specimen was also studied by Doctor Elson B. Helwig, who agreed that the findings were consistent with juvenile xanthogranuloma (nevoxanthoendothelioma).

In the immediate postoperative period, the cornea became slightly more hazy and the iris appeared to be entirely infiltrated with hemorrhagic tumor tissue.

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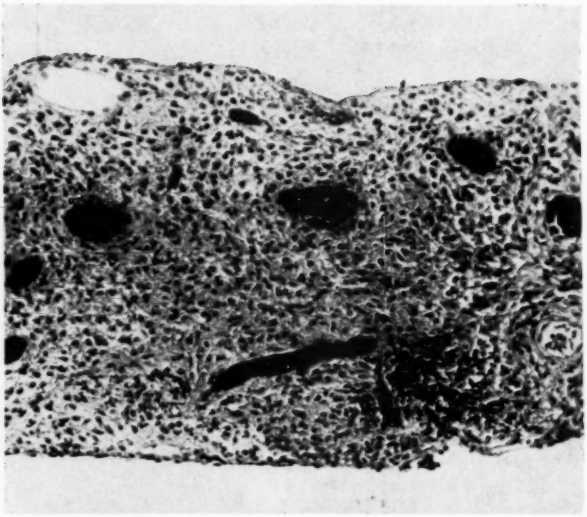

FIG. 2—Biopsy of iris tissue, showing histiocytic infiltration. (X125)

Iris prolapse occurred at the seven o'clock position (fig. 4).

On November 12, 1958, roentgentherapy was started. The dosage was 200 r with the following factors: 100 KV, 20 MA, 2 mm. AL filter, HVL 4.8 mm. AL, TSD 24 inches. Two days later the cornea was clearer, the blood was nearly gone, patches of normal iris stroma were visible, and the prolapse was less prominent (fig. 5). At this time another irradiation treatment with a dosage of 200 r was given, followed by a third treatment three days later. Improvement continued, and when the patient returned home on November 19, two days after the final treatment, the cornea and anterior chamber were clear; there was only a small residual patch of tumor on the iris and the prolapse had regressed completely (fig. 6). Since that time the eye has remained clear except for minimal cataractous lens change (fig. 7). Currently the intraocular tension is normal and there is no evidence of recurrence. It is likely that a somewhat smaller total dose of x-ray would be equally effective with less risk of lens damage.

DISCUSSION

There has been an increasing number of cases of nevoxanthoendothelioma with ocular involvement reported in recent years[1-3,7-9,11] The clinical and histologic pictures are sufficiently characteristic that the diagnosis can be made in some cases in the absence of associated skin lesions. Usually a yellowish, poorly demarcated mass appears on the iris in the first year of life, although one

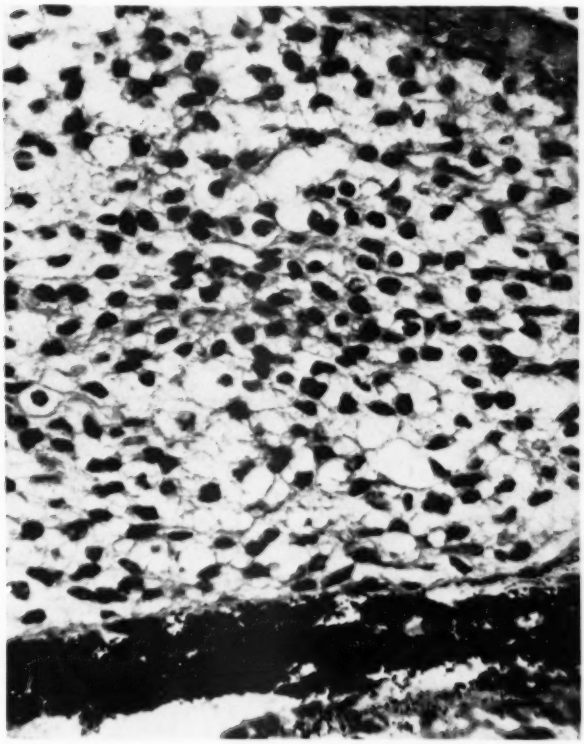

FIG. 3—Biopsy of iris tissue. (X425)

case of epibulbar involvement has been reported,[2] and two cases have been reported in which the patient was three years old.[2,8] Recurrent anterior chamber hemorrhage usually occurs and secondary glaucoma develops, leading to loss of function of the involved eye. Yellowish nodules frequently appear on the skin at about the time of the ocular involvement and tend to regress spontaneously, leaving only a faint scar. Biopsy shows histiocytic infiltration of the corium, often with accompanying Touton-type giant cells and eosinophiles. Similar large histiocytes are present in the iris and ciliary body, usually accompanied by large thin-walled blood vessels. The Touton type of giant cell may be present, but is much less frequent in the iris than in the skin.[11] There is no abnormality of the serum lipids and systemic involvement has been reported only rarely.[8] Why the skin and iris are selectively involved is not known, although at autopsy, lesions in the lung and testes were found in one patient,[5] which suggests that subclinical visceral involvement is a definite possibility.

The term *nevoxanthoendothelioma* is

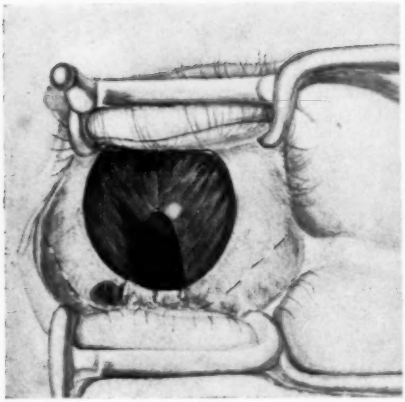

FIG. 4—Appearance following biopsy.

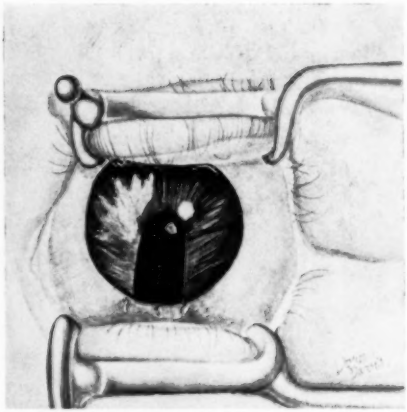

FIG. 6—Appearance of the eye after completion of roentgen therapy. November 19, 1958.

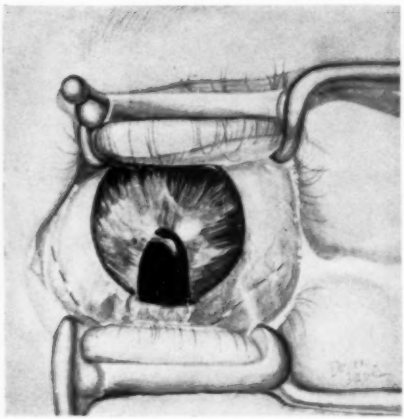

FIG. 5—Appearance two days after first treatment with roentgen rays.

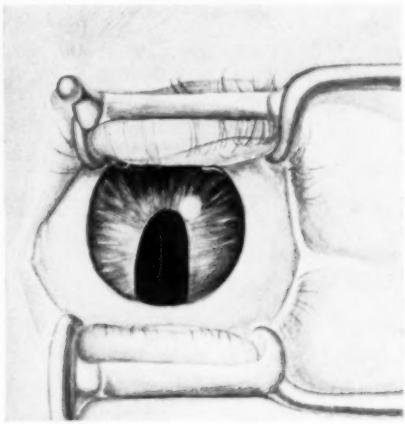

FIG. 7—Present appearance of the involved eye.

not completely accurate, since the lesion is neither a nevus nor an endothelioma. *Juvenile xanthogranuloma* is the name which might more properly be applied.[5,10]

The occasional occurrence of ocular and visceral involvement tends to link this condition with the histiocytic diseases, eosinophilic granuloma, Hand-Schüller-Christian disease and Letterer-Siwe disease. It has been advocated that the histiocytoses are related and might be designated by the term *Histiocytosis-X*.[6]

It was not appreciated until recently that ocular lesions of juvenile xanthogranuloma are radiosensitive.[4,8] It is very encouraging that roentgen therapy can apparently save eyes which would often be otherwise lost through secondary complications.

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In Memoriam

James Paulette Aderhold.....San Antonio, Texas
January 21, 1961

Henry Ernest Binger.....Phoenix, Arizona
March 13, 1961

Henry H. Black.....Pittsburgh, Pennsylvania

Nelson Miles Black.....Miami, Florida
June 13, 1961

Richard Omri Bullis, Jr.....Los Gatos, California
January 9, 1961

C. Coulter Charlton.....Absecon, New Jersey
January 9, 1961

Kosciusko Walker Constantine.....Palm Beach, Florida
April 19, 1961

William Albert Cook.....Tulsa, Oklahoma
December 30, 1960

Philip Harold Fink.....Kew Gardens, New York
March 27, 1961

Louis Zolo Fishman.....Walnut Creek, California
December 17, 1960

Henrik Sofas Graeser.....Woodland, California
February 26, 1961

Edward William Harris.....Columbus, Ohio
March 30, 1961

Hollis Carlyle Ingram.....Orlando, Florida
June 18, 1961

Edgar William Killian.....Streator, Illinois
January 4, 1961

Percy Blakely Macfarlane.....Hamilton, Ont., Canada
May 19, 1961

TRANSACTIONS

American Academy of Ophthalmology and Otolaryngology

Official Publication of the American Academy of Ophthalmology and Otolaryngology
Published under the direction of the Editorial Board
WILLIAM L. BENEDICT, Rochester, Minnesota, *Editor*
W. HOWARD MORRISON, Omaha, Nebraska, *Associate Editor*
HENRY L. WILLIAMS, Rochester, Minnesota, *Associate Editor*
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William L. Benedict, M.D., LL.D., Executive Secretary-Treasurer
American Academy of Ophthalmology and Otolaryngology
15 Second Street S.W., Rochester, Minnesota

EMPLOYMENT REGISTRY FOR SCIENTISTS

The Employment Registry for Scientists in fields pertaining to Ophthalmology and/or Otolaryngology is an information center for basic science personnel supported by a grant from the National Institutes of Health and directed by the American Academy of Ophthalmology and Otolaryngology. Candidates for training in research as well as in teaching are available while finishing preparation for permanent positions. Candidates for positions in institutions can learn of new openings, and employers can learn of available personnel with adequate training and experience through confidential registration with the Academy Registry.

Registration by scientists does not necessarily imply that the registrant is now looking for a new position or that he is in any way dissatisfied with his present position. However, it is assumed that registration by an institution implies that a position is open for employment of a trained teacher or researcher in a specified area. At the Registry the available information is matched, and both the candidate and the institution are advised of information on file. The correspondence from there on is between the parties concerned, and the Registry has no further part to play. The Registry is not a placement agency and assumes no responsibility beyond transmitting information voluntarily provided.

The files contain a number of letters from residents who are completing service in clinical work and who wish to locate in a teaching institution where they can do part-time research and teaching while getting additional clinical training. This is particularly true of foreign-born students. Some have no special research interest, while others indicate fields of special interest, such as "retina," "physiologic optics," "speech," "chemical," "virology," and others throughout the category. It is quite evident that there is a growing interest in research and that more and more men have been prepared for advanced work through the opportunities afforded by grants from the Public Health Service, by foundations and from educational institutions. The number of jobs for trained scientists will materially increase with the expansion of facilities in institutions and new medical schools and hospitals. A current listing of "positions open" and "trained scientists available" should be helpful in bringing about a balanced program in development of basic sciences with clinical opportunities.

FINANCIAL REPORT

Annual Audit for Calendar Year 1960

EXHIBIT

I Balance Sheets—December 31, 1960

II Statement of General Fund Income and Net Worth for the Year Ended December 31, 1960

III Analysis of Educational Trust Fund Transactions for the Period August 6, 1960 to December 31, 1960

IV Analysis of Grants-in-Aid and Special Custodial Funds for the Year Ended December 31, 1960

V Schedule of Securities Owned, December 31, 1960

May 8, 1961

American Academy of
Ophthalmology and Otolaryngology
Rochester, Minnesota

Gentlemen:

We have examined the balance sheet of the General Fund and the Educational Trust Fund of the American Academy of Ophthalmology and Otolaryngology (an unincorporated association), as of December 31, 1960, and the related statements of income and net worth for the year then ended. Our examination was made in accordance with generally accepted auditing standards and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

During 1960 the Academy completed setting up an Educational Trust and on August 6, 1960, transferred securities to the Trust. Therefore, the accompanying balance sheet as of December 31, 1960, has been separated into two basic funds, General Fund and Educational Trust Fund, rather than one balance sheet as presented in previous years. Disbursements from the Educational Trust Fund can be made only in accordance with provisions of the trust agreement.

In our opinion, the accompanying balance sheet and related statements of income and net worth present fairly the financial position of the General Fund and the Educational Trust Fund of the American Academy of Ophthalmology and Otolaryngology at December 31, 1960, and the results of its operations for the year then ended, in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year, except that securities at December 31, 1960, are valued at cost rather than market value as in previous years. We approve of this change in method of valuation of securities.

Comments on operations and the scope of our examination are included in the following paragraphs of this report.

HISTORY AND ORGANIZATION

The American Academy of Ophthalmology and Otolaryngology, with offices in Rochester, Minnesota, was organized in 1896. The purpose of the Academy is to promote and advance the science and art of medicine appertaining to the eye, ear, nose and throat.

The Academy's insurance coverage at December 31, 1960, was as follows:

Type of Coverage	*Amount*
Fire and Extended Coverage:	
Contents (80% co-insurance)	$ 10,000
Property Floater:	
Bound volumes, manuals and abstracts	15,000
Equipment	25,175

General Liability:	
Bodily injury	100,000/300,000
Property damage	5,000/25,000
Forgery and Check Alteration	10,000

In addition the Academy carries a fidelity bond on the Executive Secretary-Treasurer in the amount of $25,000, and other employees, $2,500, and workmen's compensation insurance at statutory amounts including coverage for help hired at the annual convention. A broad form policy is carried covering the destruction or disappearance of money, securities and other property up to $3,225 within the premises, and $2,100 outside the premises when conveyed by a messenger. This coverage is increased to $40,000 with a limit of $20,000 on money during the annual convention.

FINANCIAL POSITION

General Fund cash balances at December 31, 1960, were as follows:

Petty Cash		$ 25
Demand Accounts:		
Northwestern National Bank, Rochester, Minn...	$37,967	
Bank of Montreal, Toronto, Canada	4,310	42,277
Time Accounts:		
Olmsted Savings & Loan Ass'n, Rochester, Minn..	25,585	
Rochester Building & Loan Ass'n, Rochester, Minn..	25,281	50,866
Total		$93,168

Accounts receivable, other than from dues, decreased approximately $2,400 from the total outstanding at December 31, 1959. Approximately 81 per cent of the total "accounts receivable—other" outstanding at December 31, 1960, represent current billings.

Inventory at December 31, 1960, primarily represents books and publications held for sale to members and others. The amount of inventory on hand at December 31, 1960, decreased approximately $11,000 from December 31, 1959. This decrease primarily occurred in the Atlas of Otolaryngic Pathology inventory, and resulted from effective efforts of the Academy to increase sales of this Atlas.

The "deposit on atlas in process of publication" of $3,965 represents an advance on the cost of publishing "Stapes Operations in 3-D," which will be available some time in 1961 for sale to members and others. This advance represents half of established cost of publishing 1000 atlases. Subscriptions have been received for approximately 500 atlases.

As stated previously, establishment of the "Educational Trust Fund" was completed in 1960. The financial condition of this trust fund at December 31, 1960, is set forth in Exhibit I.

Except for equipment acquired prior to September 1, 1942, which was appraised at $1,420.28 as of January 1, 1944, furniture and fixtures are stated at cost. New equipment additions during 1960 totaled approximately $600.

The cost of motion picture films and slides entitled "Embryology of the Eye" and "Embryology of the Ear" represents original production costs of these films and slides, which were prepared by Sturgis-Grant Productions, Inc. The Academy is amortizing the cost of these films and slides at a rate which appears reasonable.

During the year 1960, the Academy charged off to expense $15,885.35 representing the amount invested towards development of the Atlas of Slit Lamp Gonioscopy. This Atlas has been in process of compilation since 1956 and it appears very doubtful that it will ever be completed.

OPERATIONS

A comparative statement of General Fund income for the years ended December 31, 1960 and 1959, in condensed form, is as follows:

[See next page.]

The increase in operating income of $27,500 during 1960 resulted principally from an increase in rate of membership dues.

The decrease in total operating expenses resulted from creation of the "Educational Trust Fund" which absorbed operating expenses of the Educational Fund subsequent to August 6, 1960.

Convention expenses increased $8,900 during 1960 as compared to 1959. This increase resulted in part, from a delayed billing from the Palmer House for 1959 expenses in the amount of $3,668 included as 1960 expense.

Other deductions for 1960 consist of development costs of an atlas of slit lamp goni-

	Year Ended December 31, 1960	1959	*Increase or* **Decrease**
Revenues	$329,800	$304,000	$25,800
Operating Expenses			
General administrative	$116,200	$116,900	**$ 700**
Educational Fund	14,100	25,500	**11,400**
Home Study Courses	12,800	12,500	300
Convention expenses	72,800	63,900	8,900
TRANSACTIONS	91,500	90,300	1,200
Total operating expenses	$307,400	$309,100	**$ 1,700**
Operating income **(loss)**	$ 22,400	**$ 5,100**	$27,500
Other Deductions	15,900	100	15,800
Net income **(loss)**	$ 6,500	**$ 5,200**	$11,700

	COST	MARKET	EXCESS OF MARKET OVER COST
December 31, 1960	$368,076.28	$421,591.80	$53,515.52
December 31, 1959	349,791.54	417,903.60	68,112.06
Increase **(Decrease)**	$ 18,284.74	$ 3,688.20	**$14,596.54**

oscopy charged off to expense, as explained in a previous paragraph of this report.

The Academy in previous years has followed the policy of valuing securities at current market value. This policy was changed in 1960, and securities owned at December 31, 1960, are valued at cost.

A comparison of the cost and market value of "Educational Trust Fund" securities at December 31, 1960, with securities (other than Wherry Memorial Fund investment in Savings & Loan shares) at December 31, 1959, is as follows:

[Table shown above.]

At December 31, 1960, the market value of securities was approximately 14.5 per cent in excess of cost. Although the investment in securities (at cost) increased $18,284.74 over December 31, 1959, the market fluctuation from cost decreased approximately $14,600 from that date. This decline, we understand, reflects general market conditions at December 31, 1959 and 1960.

SCOPE OF AUDIT

Our examination included but was not limited to the following procedures.

Cash in banks and savings and loan associations were reconciled with the balances confirmed to us by the depositaries.

Accounts receivable balances as shown on the individual subsidiary records were reconciled with the control accounts as of December 31, 1960. We circularized individual balances (except membership dues receivable) on a test basis as of December 31, 1960, and in the replies received to date representing approximately 31 per cent of total accounts receivable (other than membership dues), no material differences were disclosed. We reviewed the collectibility of the accounts receivable, and in the opinion of Academy personnel, no material losses or adjustments are anticipated in the collection of the accounts outstanding at December 31, 1960.

Inventories were determined by physical

count taken by Academy employees as of December 31, 1960. We observed the inventory taking and made test counts of quantities. Our review indicated that satisfactory methods were used in the determination of quantities. We made test checks of the clerical accuracy and the pricing of inventories, which indicated that they were clerically accurate and priced at cost.

Prepaid insurance and postage were determined to be properly applicable to future operations.

General Fund investments totaling $5,400 were confirmed directly with the Rochester Building and Loan Association.

Educational Trust Fund securities were confirmed by direct correspondence with the First National Bank of Minneapolis, Minnesota.

Fixed asset accounts were reviewed and additions were traced to invoices and other supporting data. We checked the depreciation computations and reviewed the depreciation rates, which appeared reasonable in relation to the estimated life of the depreciable property.

We made test checks of the records of accounts payable, accrued expenses and other liability accounts. We analyzed the grant-in-aid accounts for the year ended December 31, 1960, comparing receipts with "notification of grant-in-aid awards" received from the National Institutes of Health, Department of Health, Education and Welfare, Bethesda, Maryland. Expenditures from grant-in-aid funds were checked on a test basis against invoices and other supporting data. We confirmed the amounts owing to major suppliers at December 31, 1960, by direct correspondence with the creditors. Insofar as we could ascertain from our examination, all direct and contingent liabilities at December 31, 1960, are reflected in the accompanying balance sheet, and management has represented that all such liabilities were disclosed to us.

Very truly yours,

BROEKER & HENDRICKSON
(Successors to Byers, Wobschall & Miller)
Certified Public Accountants

EXHIBIT I

AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY
(An Unincorporated Association)
Balance Sheets—December 31, 1960

ASSETS

GENERAL FUND

Current Assets:		
Cash—		
Petty cash	$ 25.00	
Demand accounts	42,276.77	
Time accounts	50,866.24	$ 93,168.01
Membership dues receivable—delinquent		1,557.50
Accounts receivable—other		6,124.41
Inventories, at cost—		
Abstracts, manuals, films and Bound Volumes	26,350.83	
Atlas of Otolaryngic Pathology	12,460.08	38,810.91
Deposit on atlas in process of publication		3,965.00
Prepaid insurance		682.25
Prepaid postage, etc.		118.98
Total current assets		$144,427.06
Investments, at cost (Wherry Memorial Funds—per contra)		5,400.00

	COST	ACCUMULATED DEPRECIATION	NET	
Fixed Assets, at cost:				
Furniture and equipment	$ 21,799.17	$ 13,764.76	$ 8,034.41	
Films and slides—				
Embryology of the Eye	41,775.00	41,098.75	676.25	
Embryology of the Ear	104,516.62	59,715.08	44,801.54	
	$168,090.79	$114,578.59	$53,512.20	53,512.20
Total, General Fund				$203,339.26

EDUCATIONAL TRUST FUND

Cash	$ 9,027.22
Investments, at cost (approximate market value $421,591.80)	368,076.28
Total, Educational Trust Fund	$377,103.50
Total, All Funds	$580,442.76

Liabilities and Net Worth

Current Liabilities:	
Accounts payable	$ 21,140.40
Due to audiometer testing stations	400.00
Accrued payroll taxes	996.45
Prepayments for Bound Volumes, etc.	4,548.00
Grants-in-aid and custodial funds (unexpended balances)	113,595.28
Deferred income, membership dues	255.00
Total current liabilities	$140,935.13
Wherry Memorial Lecture Fund Balance	5,901.55
Net Worth, per accompanying statement	56,502.58
Total, General Fund	$203,339.26

Educational Trust Fund

Fund Balance, per accompanying statement	$377,103.50
Total, Educational Trust Fund	$377,103.50
Total, All Funds	$580,442.76

EXHIBIT II

AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY
Statement of General Fund Income and Net Worth
For the Year Ended December 31, 1960

Revenues:			
Membership dues			$103,882.00
Membership applications			4,212.00
Abstracts, manuals and monographs—			
Sales		$ 12,828.05	
Inventory cost		12,155.38	672.67
Atlas of Otolaryngic Pathology—			
Sales		$ 12,652.00	
Inventory cost		10,308.88	2,343.12
Certificates			1,026.20
Films and slides			1,960.00
Testing and calibration of tonometers			1,221.00
Royalties			504.00
Convention			100,535.00
Home Study Courses			9,734.00
TRANSACTIONS			89,113.14
Income from securities (prior to trust fund)—			
Interest		$ 1,822.16	
Dividends		11,139.57	
Gain on sale of securities		239.54	13,201.27
Other interest received, etc.			1,361.01
Total revenues			$329,765.41
Operating Expenses:			
General administrative		$116,178.59	
Educational Fund—			
Trustee fees	$ 267.59		
Depreciation, films and slides	10,819.16		
Scholarships	3,000.00	14,086.75	
Home Study Courses		12,793.23	
Convention expenses		72,855.57	
TRANSACTIONS		91,499.46	307,413.60
Operating income			$ 22,351.81
Deduct—Abandonment of an atlas of slit-lamp gonioscopy			15,885.35
Net income for the year			$ 6,466.46
Net Worth, December 31, 1959			490,822.64
			$497,289.10
Deduct:			
Securities transferred to Educational Trust Fund		$372,674.46	
Market value fluctuation carried on books applicable to above securities transferred		68,112.06	440,786.52
Net Worth, December 31, 1960			$ 56,502.58

EXHIBIT III

AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY
Analysis of Educational Trust Fund Transactions
For the Period August 6, 1960, to December 31, 1960

Transfer from General Fund, August 6, 1960		$372,674.46
Additions:		
Income from securities—		
Dividends	$ 7,328.09	
Interest	2,350.06	
Contributions received	308.67	9,986.82
		$382,661.28
Deductions:		
Loss on sale of securities	$ 1,516.37	
Trustee fees	679.15	
Awards and Scholarship	3,200.00	
Miscellaneous expenses	162.26	5,557.78
Fund Balance, December 31, 1960		$377,103.50

EXHIBIT IV

AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

Analysis of Grants-in-Aid and Special Custodial Funds
For the Year Ended December 31, 1960

N. I. H. GRANTS-IN-AID 3-B-9023 (c1), B-2359 (c2) AND B-2359 (c3) (UVEITIS)

	3-B-9023(c1)	B-2359(c2)	B-2359(c3)	UNEXPENDED BALANCE DEC. 31, 1960
Balance, December 31, 1959	$16,890.07	$33,457.85	—	
Receipts, for year 1960—				
Treasury of United States	—	—	$21,528.00	
Transfers by order of N. I. H.	**16,890.07**	**9,637.93**	26,528.00	
	—	$23,819.92	$48,056.00	
Expenditures during 1960	—	2,135.18	11,931.54	
Balance, December 31, 1960	—	$21,684.74	$36,124.46	$ 57,809.20

N. I. H. GRANTS-IN-AID B-2375 (c2), B-2375 (c3) AND B-2375 (c4) (HEARING)

	B-2375(c2)	B-2375(c3)	B-2375(c4)	
Balance, December 31, 1959	$57,707.13	—	—	
Receipts, for year 1960—				
Treasury of United States	—	$62,200.00	—	
Transfers by order of N. I. H.	**9,336.40**	5,000.00	$ 4,336.40	
	$48,370.73	$67,200.00	$ 4,336.40	
Expenditures during 1960	48,370.73	20,421.30	1,922.80	
Balance, December 31, 1960	—	$46,778.70	$ 2,413.60	49,192.30

N. I. H. GRANT-IN-AID 2B-5296 (EMPLOYMENT REGISTRY FOR SCIENTISTS)

Balance, December 31, 1959	$ 3,401.54	
Receipts, for year 1960—		
Treasury of United States	3,937.00	
	$ 7,338.54	
Expenditures during 1960	4,965.45	
Balance, December 31, 1960	$ 2,373.09	2,373.09

SUBCOMMITTEE ON CONSERVATION OF HEARING IN CHILDREN

Balance, December 31, 1959	—	
Receipts, for year 1960	$ 5,000.00	
	$ 5,000.00	
Expenditures during 1960	779.31	
Balance, December 31, 1960	$ 4,220.69	4,220.69

Total unexpended balance, December 31, 1960 ..... $113,595.28

EXHIBIT V

American Academy of Ophthalmology and Otolaryngology
Schedule of Securities Owned, December 31, 1960

EDUCATIONAL TRUST FUND

BONDS	INTEREST RATE %	MATURITY	FACE VALUE	COST	APPROXIMATE MARKET VALUE
Van Sweringen Co., Certificates of Indebtedness, Series 1925	6	12/31/48	$ 790.70	$ 822.03	—
Dominion of Canada	3¼	10/ 1/79	8,500.00	8,207.34	$ 6,757.50
Dominion of Canada	4½	9/ 1/83	13,500.00	13,250.00	11,846.25
American Tel. & Tel. Debenture	5⅜	11/ 1/86	10,000.00	10,225.00	10,650.00
Federal Land Bank—1970	5⅛	2/20/70	10,000.00	10,025.00	10,624.00
Household Finance Corp. Debentures	4⅞	1/ 1/81	20,000.00	20,200.00	20,325.00
Mo. Pac. Railroad Equipment, Series N.	4¼	6/ 1/70	20,000.00	19,689.43	19,400.00
U. S. Treas. Cert. of Indebt., Series B	4⅜	5/15/61	10,000.00	9,956.25	10,021.00
United States Treasury Notes, Series B.	5	8/15/64	20,000.00	20,000.00	21,040.00
Utah Power and Light Co.	4⅞	9/ 1/90	20,000.00	20,125.00	20,350.00
Transcontinental Gas Pipe Line Corp.	5¼	11/ 1/80	20,000.00	20,400.00	20,350.00
Total bonds				$152,900.05	$151,363.75

STOCKS	KIND	PAR VALUE	SHARES		
Commonwealth Edison Co.	Common	$ 25.00	106	$ 2,275.56	$ 7,261.00
E. I. DuPont de Nemours & Co.	Common	5.00	60	2,347.31	11,235.00
Investors Diversified Services	Common A	1.00	100	6,785.95	18,000.00
Bank of America, NT&SA	Common	6.25	100	3,950.00	4,875.00
Farwell Ozmun Kirk & Co.	Capital	50.00	100	7,800.00	7,500.00
Louisville Gas & Electric Co.	Preferred, 5%	25.00	200	5,450.00	5,300.00
Kaiser Aluminum & Chemical	Conv. Pfd., 4¾%	100.00	50	5,000.00	5,212.50
Minneapolis Gas Co.	Preferred, 5½%	100.00	20	2,060.00	1,960.00
Incorporated Income Fund	Capital	1.00	3,272	32,617.80	24,507.28
Wellington Fund, Inc.	Common	1.00	4,042	53,583.57	56,143.38
Boston Fund	Common	1.00	634	12,184.12	11,783.68
One William Street Fund	Capital	1.00	2,121	26,048.82	27,382.11
Massachusetts Investors Trust	Trust Cert. B/I	0.33⅓	4,100	22,208.77	54,694.00
United Utilities, Inc.	Common	10.00	215	9,352.50	9,271.85
Holt Rinehart & Winston, Inc.	Common	1.00	102	4,667.13	5,469.75
International Business Machines	Capital	5.00	10	5,307.50	5,930.00
General Electric Co.	Common	5.00	70	5,239.95	5,215.00
Merck & Co.	Common	0.16	100	8,297.25	8,487.50
Total stocks				$215,176.23	$270,228.05
Total, Educational Trust Fund.				$368,076.28	$421,591.80

WHERRY MEMORIAL FUND

Rochester Building and Loan Ass'n.	Capital	100.00		$ 5,400.00	$ 5,400.00

SIXTY-SIXTH ANNUAL MEETING

American Academy of Ophthalmology and Otolaryngology

OCTOBER 8 TO 13, 1961

PALMER HOUSE

Chicago, Illinois

OFFICIAL NOTICES

Convention Call

Under the authority of the Constitution and with the approval of the Council, I herewith proclaim that the Sixty-Sixth Annual Session of the American Academy of Ophthalmology and Otolaryngology will convene at the Palmer House, Chicago, Illinois, on Monday, October 9, 1961, at 9:30 a.m., and will continue through Friday, October 13, 1961.

DOHRMANN K. PISCHEL, M.D.
President

Attest:
WILLIAM L. BENEDICT, M.D.
Executive Secretary-Treasurer

Council Meetings

The Council of the American Academy of Ophthalmology and Otolaryngology will convene at nine o'clock, Saturday morning, October 7, 1961, in Private Dining Room 4 of the Palmer House, Chicago. There will also be a meeting of the Council on Wednesday, October 11, at 12:45 p.m. in Private Dining Room 5. Members desiring to be heard or to present business will confer with the Executive Secretary-Treasurer for appointments.

DOHRMANN K. PISCHEL, M.D.
President

Business Meeting

The Annual Business Meeting of the Academy will be held in the Crystal Room of the Palmer House on Thursday, October 12, 1961, at 5:30 p.m.

The Order of Business:

1. Call to order
2. Report of Executive Secretary-Treasurer
3. Report of the Senior Member of the Council
4. Election of Fellows
5. Election of Officers
6. Unfinished business
7. New business

All Fellows and candidates for election to Fellowship are urged to attend.

New Business

Proposals for new activities often are presented too late during the Academy session to afford time for deliberation. Therefore, new items requiring Council action should be presented in writing to the Executive Secretary-Treasurer early so that the Committee concerned may have an opportunity to study the matter prior to presentation to the Council.

Public Relations

Contributors to the scientific program are requested to send copies of their papers to the Secretary for Public Relations, Glen G. Gibson, M.D., 2031 Locust Street, Philadelphia 3, at the earliest possible moment.

Exhibits

The Scientific and Technical Exhibits will open at nine o'clock on Sunday morning, October 9. They will close at four o'clock Sunday afternoon for the President's Reception. From Monday through Friday they will open at 8:30 a.m. The Scientific Exhibit will close at 5:30 p.m. each day, and the Technical Exhibit at 5:00 p.m., except that they will both close on Friday, October 13, at twelve o'clock noon.

Dues

Membership card for 1961 is required for registration at the Academy meeting. Those who have not paid dues for 1961 are requested to remit to W. L. Benedict, M.D., Executive Secretary-Treasurer, 15 Second Street S.W., Rochester, Minn. In case of loss, a duplicate membership card may be obtained upon request.

Registration

The badge secured at the time of registration is essential for admittance to all activities.

TIME AND PLACE

Sunday—9:00 a.m. to 4:00 p.m.

Monday through Thursday—8:30 a.m. to 5:00 p.m.

Friday—8:30 a.m. to 12:00 noon.

Foyer to the Grand Ballroom on Fourth Floor of the Palmer House.

Each registrant is required to fill out a registration card and present it to the proper desk as outlined below. Registration cards will be found on tables in the Foyer.

To facilitate registration, the following sections will be provided:

All Fellows without Advance Registration (see below)

Membership card for 1961 is required for registration. Dues outstanding may be paid at this desk.

Nonmembers (Fee of $10.00 required)
- Guest physicians
- Nonmedical guests

Nonmembers (No fee required)
- Residents who hold Academy Guest Card for 1961 obtained by Head of Department
- Special Guests (1961 Guest Card required)

Orthoptic Technicians (A.A.O.T.)

ADVANCE REGISTRATION

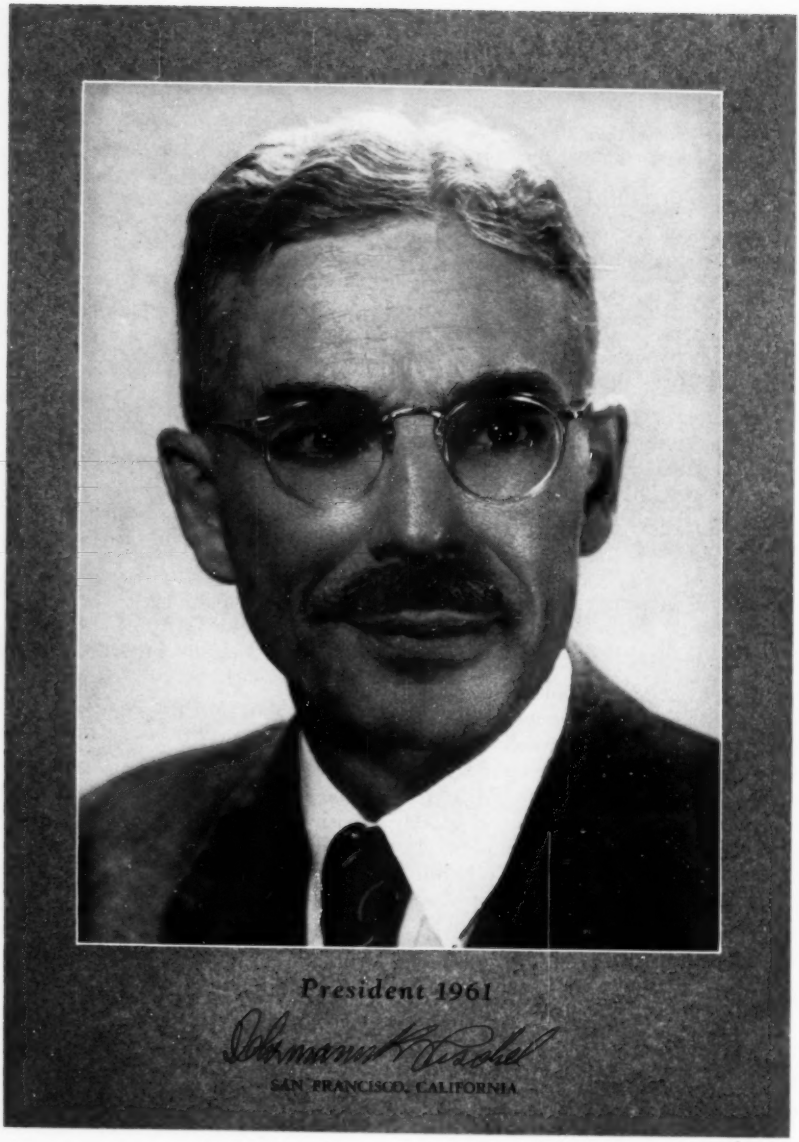
Fellows who have ordered Instruction Courses in advance

Instructors

Contributors to Scientific Program

Contributors to Scientific Exhibit

Candidates for Academy Fellowship



President 1961

SAN FRANCISCO, CALIFORNIA

Guest of Honor

PETER CLEMENS KRONFELD, M.D.

PROFESSOR AND HEAD OF THE DEPARTMENT OF OPHTHALMOLOGY
UNIVERSITY OF ILLINOIS COLLEGE OF MEDICINE

Doctor of Medicine, University of Vienna, 1923.

Instructor in Physiology, 1921-1925, Assistant in Ophthalmology, 1926-1927, University of Vienna; Assistant Professor, 1927-1931, Associate Professor, 1931-1933, University of Chicago; Professor and Head of Department, Peiping Union Medical College, 1933-1939; Assistant Professor, Northwestern University Medical College, 1941-1943; Associate Professor, University of Illinois College of Medicine, 1943-1947, Professor, 1947-, Head of Department, 1959-.

Member of the Committee on Medical Problems of Civil Aviation, and of the Committee on Selection and Training of Aircraft Pilots, National Research Council, Past Chairman and Member of the Committee on the Standardization of Tonometers of the American Academy of Ophthalmology and Otolaryngology.

Awarded prize of the Vienna Ophthalmological Society, 1926; Honor Award American Academy of Ophthalmology and Otolaryngology, 1947; Prize in Ophthalmology, Section on Ophthalmology of the American Medical Association, 1958.

Member of Ophthalmological Societies of France, Germany and the United Kingdom. Member of the American Ophthalmological Society, Association for Research in Ophthalmology, Society for Experimental Biology and Medicine. Fellow, American Medical Association and American Academy of Ophthalmology and Otolaryngology.

Guests

Physicians who are not members are welcome to attend the meeting of the Academy as guests and to participate in all the activities. All guests, however, will be required to register, and to pay a fee of $10.00.

On written request by members of the Academy to the Executive Secretary in advance of the annual meeting, nurses, technicians, assistants, social workers and others will be admitted as guests without fee. Guest cards will be mailed to such persons in advance of the meeting. All other guests will pay a registration fee of $10.00. Requests for registration without fee made at the registration desk at the time of the meeting will not be honored unless the guest is accompanied by a member or the member has sent a letter with the guest.

Residents

Men in training in accepted residencies, or those now completing a full academic year (nine months) in basic study, may register without fee upon presentation of a guest card obtained by written request of their Department Heads.

Requests from Department Heads for guest cards should be sent to W. L. Benedict, M.D., 15 Second Street S.W., Rochester, Minn., by September 28.

Instruction Course Tickets

The tickets for courses in ophthalmology and the tickets for courses in otolaryngology and maxillofacial surgery will be sold at separate desks in Private Dining Room 18 on the Club Floor. Bulletin boards behind each desk will indicate what tickets are available. Please consult these boards in making your selections. Bear in mind that individual courses are for one hour only; continuous courses run for two or more hours. Price of tickets is $2.00 per hour.

It is necessary to register and to be wearing a regulation badge in order to purchase instruction course tickets.

Tickets for the Orthoptic Technicians' instruction courses may be purchased here.

Ladies' Registration

The wives of members and guests are urged to register at the Ladies' Headquarters on the eighth floor of the Palmer House, Room 834. Registration will open at nine o'clock, Sunday morning, October 8, and will close Thursday evening, October 12.

Coffee and rolls will be served daily from 10:00 to 11:30 a.m. each day and from 3:30 to 5:00 p.m. each day except Sunday in the Ladies' Hospitality Suite, Rooms 832-834.

CONVENTION ACTIVITIES

PRESIDENT'S RECEPTION

Grand-State Ballroom

Sunday, 4:30 p.m.

President Dohrmann K. Pischel and Mrs. Pischel invite all members and guests of the Academy to a reception on Sunday, October 8, at 4:30 p.m. in the Grand-State Ballroom.

XVII WHERRY MEMORIAL LECTURE

Sponsored by the Wherry Memorial Fund

The XVII Wherry Memorial Lecture will be delivered at the scientific session of the Section on Otolaryngology Wednesday afternoon, October 10, by Paul Henry Holinger, M.D., of Chicago. Doctor Holinger is Professor of Bronchoesophagology in the Department of Otolaryngology, University of Illinois College of Medicine. The subject of Doctor Holinger's address will be "Foreign Bodies in the Air and Food Passages." It will be illustrated by a motion picture.

XVIII JACKSON MEMORIAL LECTURE

Sponsored by the Ophthalmic Publishing Co.

George K. Smelser, Ph.D., of New York, Professor of Anatomy in the Division of Ophthalmic Research of the Department of Ophthalmology, Columbia University College of Physicians and Surgeons, and Technical Director in the production of the Academy film on Embryology of the Eye, produced in 1950, will deliver the XVIII Jackson Memorial Lecture at the scientific session of the Section on Ophthalmology, Tuesday morning, October 10. The subject of his lecture will be "Experimental Studies on Exophthalmos."

THE ANNUAL BANQUET

Grand-State Ballroom

Monday, 7:00 p.m.

Doors open at 6:30 p.m. Bar service will be available. Dress optional.

Tickets will be on sale beginning Sunday morning at nine o'clock in the Registration Area. Tables may be reserved, ten places to a table. Sale will close at two o'clock Monday afternoon.

FACULTY BREAKFAST

Victorian Room

Monday, 7:30 a.m.

Members of the Section on Instruction Faculty are invited to be guests of the Academy at a Buffet Breakfast in the Victorian Room, 7:30 a.m. to 9:00 a.m., Monday, October 9.

ALUMNI FUNCTIONS — 1961

The following alumni groups will hold dinners, luncheons, or cocktail parties during the Academy meeting. Most of these functions will be held on Wednesday evening, October 11, 1961. (A

complete listing including time and place of function, and address of the secretary for each group will appear in the Pocket Program issued at the Academy meeting.)

Allen Residents Club

Baltimore Eye, Ear and Throat Alumni

Boston City Hospital Aural and Ophthalmic Society

Brooklyn Eye and Ear Hospital Alumni

J. Mackenzie Brown Annual Dinner

Cook County Hospital Alumni Ophthalmological and Otolaryngological

Detroit Receiving Hospital Ophthalmic Alumni

Duke Alumni

Henry Ford Hospital Alumni

Gill Memorial Eye, Ear and Throat Hospital Alumni—Annual Spring Congress

Grady Memorial Hospital Alumni

Harper Hospital Alumni

Heed Ophthalmic Foundation Alumni (Society of Heed Fellows)

Illinois Eye and Ear Infirmary Alumni — Ophthalmology

Johns Hopkins Hospital, Wilmer Institute Alumni

David H. Jones Alumni

Kings County Hospital Center (Brooklyn)—Otolaryngology

Dr. Arlington C. Krause Luncheon

Dean M. Lierle University of Iowa Alumni

John R. Lindsay Alumni

School of Medicine, Loma Linda University Alumni and White Memorial Hospital Alumni

Manhattan Eye, Ear and Throat Hospital Alumni

Massachusetts Eye and Ear Infirmary and Harvard Medical School Alumni

Mayo Clinic Alumni

Mount Sinai Hospital of New York Eye Alumni

Mount Sinai Hospital of New York—Otolaryngology Alumni

Newark Eye and Ear Infirmary Alumni

New York Eye and Ear Infirmary Alumni Association

New York Hospital Eye Alumni

New York University, New York Post Graduate Medical School and Bellevue Hospital Alumni

Northwestern University Alumni—Postgraduates, Residents & Staff

Ohio State Otolaryngology Alumni

Parker-Canfield Alumni Association

Presbyterian Hospital of New York Ear, Nose and Throat Alumni

Presbyterian Hospital of New York—Institute of Ophthalmology Alumni

Retina Service Alumni of the Massachusetts Eye and Ear Infirmary

University of Illinois Otolaryngologic Alumni Association

University of Minnesota Eye, Ear, Nose and Throat Alumni

University of Pennsylvania Alumni—Otolaryngology

University of Texas Medical School and Baylor University Medical School—Otolaryngology

University of Wisconsin Eye, Ear, Nose and Throat Alumni

Washington University Alumni—Ophthalmology

Washington University Alumni — Otolaryngology

Western Reserve University Alumni

Wills Eye Hospital Society Alumni and University of Pennsylvania Alumni—Ophthalmology

Tickets for alumni functions on Wednesday evening will be on sale from Sunday morning at nine o'clock until two o'clock on Wednesday in the Registration Area.

CANDIDATES--1961

The following candidates have applied for Fellowship in the American Academy of Ophthalmology and Otolaryngology and will be voted upon at the Annual Business Meeting, Thursday, October 12, 1961. Objections to the election of a candidate must be filed with the Executive Secretary-Treasurer previous to Saturday, October 7, 1961.

CANDIDATES CERTIFICATED BY BOARDS

Ophthalmology (OP)
Otolaryngology (ALR)

Aimi, Kenji, 767 Shinohara-Machi Kohoku-Ku, Yokohama, Japan, ALR

Aldous, Harold E., 2000 S. Ninth East, Salt Lake City 5, Utah, OP

Alley, Jesse Clyde, Jr., 608 Medical Arts Bldg., Nashville 12, Tenn., ALR

Amiel, Felix V., 5343 Tallman Ave., Seattle 7, Wash., ALR

Audette, Paul John, 266 Bridge St., Springfield 2, Mass., OP

Balian, John Vahan, U.S. Army Hospital, Fort Campbell, Ky., OP

Balistocky, Marvin Harold, 1018 DeKalb St., Norristown, Pa., OP

Balshi, Stephen F., 1509 Easton Ave., Bethlehem, Pa., ALR

Balstad, Paul D., 1666 Elmira, Aurora 8, Colo., OP

Beyer, Brooke Anthony, 8218 Wisconsin Ave., Bethesda 14, Md., ALR

Biggs, Robert D., 670 W. Market St., Lima, Ohio, OP

Birck, Herbert Georg, 700 Bryden Rd., Columbus 15, Ohio, ALR

Bolognesi, Anthony Van Bergen, 325 Park Ave., Huntington, N. Y., ALR

Boniuk, Milton, Baylor University School of Medicine, Houston, Texas, OP

Brennan, James Edward, 405 Cooper St., Camden 2, N. J., ALR

Brownell, Morton Emmons, Jr., 728 Columbus St., Rapid City, S. D., ALR

Brunemeier, Faylon Minch, 2020 Court St., Redding, Calif., OP

Butler, Gerald Edward, 326 N. Ingalls, Ann Arbor, Mich., ALR

Butler, Richard Graham, 2021 Monroe, Dearborn, Mich., OP

Cain, Alvin Lafayette, USPHS Hospital, Box 3145, Seattle 14, Wash., ALR

Cather, Carl Henry, Jr., 417 Spruce St., Morgantown, W. Va., ALR

Cation, Vivian A., 5945 Dempster, Morton Grove, Ill., OP

Catlin, Francis Irving, Johns Hopkins Hospital, Baltimore 5, Md., ALR

Cavallaro, Joseph William, Holzer Hospital, Gallipolis, Ohio, ALR

Chu, Roberto, Clinica San Fernando, Panama, R. P., ALR

Churchill, Bernard Phair, 1729 S. 11th St., Milwaukee 4, Wis., ALR

Cleveland, Edwin Irving, 130 Pondfield Rd., Bronxville 8, N. Y., ALR

Cohen, Howard David, 1003 Delaware Ave., Wilmington 6, Del., ALR

Collins, Elmer Clare, U. S. Naval Hospital, Portsmouth, N. H., OP

Cooper, Frank Benton, 826 W. Henderson St., Salisbury, N. C., OP

Cox, Robert H., 8126 Panola St., New Orleans, La., ALR

Cross, Albion B., Jr., 1260 Main St., Baton Rouge, La., OP

Delgado, Robert E., 2100 N. Orange Ave., Orlando, Fla., OP

De Pinies, Felix, 1105 Park Ave., New York 28, N. Y., ALR

Derrick, Cornelius Frederick, 3677 Fort St., Lincoln Park, Mich., ALR

Ehlers, Charles William III, 1300 Bancroft Ave., San Leandro, Calif., OP

Eigner, Edwin Harvey, 10900 Carnegie Ave., Cleveland 6, Ohio, OP

Ellman, Donald, 1554 Northern Blvd., Manhasset, N. Y., OP

Evans, Frederick Harris, 2140 N. Capitol Ave., Indianapolis 2, Ind., ALR

Everton, Marta Ve, 117 E. Colorado Blvd., Pasadena 1, Calif., OP

Fish, George H., U. S. Naval Hospital 926, FPO San Francisco, Calif., ALR

Fitzgerald, George Thomas, 10400 S. Western Ave., Chicago 43, Ill., OP

Foster, Ray Dewey, 1944 N. Capitol Ave., Indianapolis 2, Ind., ALR

Frank, Robert L., 514 Cooper St., Camden 2, N. J., OP

Freeman, Gordon Redfern, 2001 Fourth Ave., San Diego 1, Calif., ALR

Freese, Carl Gates, 328 Washington St., Wellesley Hills 81, Mass., OP

Gehrich, Guenter Heinz, 1101 Maine St., Quincy, Ill., ALR

Gilbert Leonard James, 1740 Marco Polo Way, Burlingame, Calif., ALR

Gillette, David R., 7222 Owensmouth Ave., Canoga Park, Calif., OP

Goble, Elise Joan Hollenberg, 1 Baywood Ave., San Mateo, Calif., OP

Goble, John Lewis, 1 Baywood Ave., San Mateo, Calif., OP

Goldstein, Edward S., 1451 N.E. Bayshore Dr., Miami 32, Fla., OP

Gotlib, Bernard N., 132 Forest Ave., Bangor, Maine, ALR

Guardiola, Pablo, De Diego St. 102, Mayaguez, Puerto Rico, ALR

Hagler, William S., Emory University Clinic, Atlanta 22, Ga., OP

Haisten, M. Wyatt, Doctors Bldg., 3155 Stagg Dr., Beaumont, Texas, OP

Hand, Robert Frederick, Canadian Forces Hospital, Halifax, N. S., Canada, OALR

Hart, George Ralston, U. S. Naval Hospital, Newport, R. I., ALR

Heare, Charles Robinson, 390 Tenth St., Beaumont, Texas, ALR

Hendershot, Edward Lawrence, 15644 Madison Ave., Cleveland 7, Ohio, ALR

Heydt, Ernest H., Jr., 216 Summit Ave., Jenkintown, Pa., OP

Hilding, David Anderson, Yale Medical School, Dept. Otolaryngology, New Haven, Conn., ALR

Hilgermann, George O., 90 S. Seventh St., Minneapolis 2, Minn., OP

Hohmann, Albert, 444 Lowry Medical Arts Bldg., St. Paul 2, Minn., ALR

Holding, Bruce F., Jr., EENT Service, Martin Army Hospital, Fort Benning, Ga., ALR

Holland, Ernst J., 2018 W. North Ave., Chicago 47, Ill., OP

Hollister, John Frazier, 2720 Capitol Ave., Sacramento 16, Calif., OP

Hoover, Richard Edwin, 14 W. Mt. Vernon Place, Baltimore 1, Md., OP

Howard, William James, 389 Linwood Ave., Buffalo 9, N. Y., OP

Hughes, Calvin Thomas, Jr., 576 Farmington Ave., Hartford 5, Conn., OP

Hull, Jess Stevens, Martin Army Hospital, Fort Benning, Ga., OP

Hurst, Alfred Lionel, 98 Adams St., Milton 87, Mass., ALR

Ignatius, Haig, 215 Needham Ave., Modesto, Calif., ALR

Ippolito, Carlo Amedeo, 165 North Village Ave., Rockville Centre, N. Y., ALR

Isbey, Edward Kenneth, Jr., 409 Flat Iron Bldg., Asheville, N. C., OP

Jako, Geza Julius, 243 Charles St., Boston 14, Mass., ALR

Jesberg, David Olsen, 220 Meridian Rd., San Jose 26, Calif., OP

Johnstone, William Wandell, East African Institute for Medical Research, Mwanza, Tanganyika, East Africa, OP

Jones, Courtland S., Jr., 384 Cleveland Dr., Buffalo 15, N. Y., ALR

Josey, John Speir, 1293 Peachtree St., N. E., Atlanta 9, Ga., OP

Karam, Farid, American University Hospital, Beirut, Lebanon, ALR

Katz, Eli, 4491 Sherbrooke West, Westmount, Que., Canada, ALR

Kelly, John J., 706 D St., San Rafael, Calif., OP

Kim, Ipbi, 44426 N. Tenth St. W., Lancaster, Calif., ALR

King, Hueston Clark, U. S. Army Hospital, West Point, N. Y., ALR

Kirchick, Julian, 230 Hilton Ave., Hempstead, N. Y., ALR

Kobs, Robert J., 608 W. Michigan Ave., Jackson, Mich., OP

Koch, John Clinton, 1306 Frank Ave., Lufkin, Texas, OP

Kramer, Bernard M., 384 Post St., San Francisco 8, Calif., ALR

Krupski, John Galahad, 125 W. 21st St., Lorain, Ohio, OP

Landis, Charles Byron, 2211 South St., Lafayette, Ind., OP

Larson, Darell Harvey, 714 Ivy, Moses Lake, Wash., OP

LaVelle, Herman Glen, Jr., Suite 526A, 899 Madison Ave., Memphis 3, Tenn., ALR

Leakos, James, 556 Medical Arts Bldg., Saskatoon, Sask., Canada, ALR

Leaman, John Creamer, 111 E. 65th St., New York 21, N. Y., OP

Lepley, Frederick John, USAF Hospital, March AFB, Calif., OP

Lewis, Earl L., 502 Torrance Blvd., Redondo Beach, Calif., OP

Lingeman, Byron Spencer, 328 Washington St., Wellesley Hills 81, Mass., OP

Link, Melvin Robert, Doctor's Bldg., Charlotte 7, N. C., ALR

Lozano-Elizondo, David, Zacatecas 229-425, Mexico City, D. F. 7, Mexico, OP

Luethy, Volker W. A., Hampton Roads Medical Center, 316 Main St., Newport News, Va., ALR

Lussier, Marcel, 310A est, Blvd. St-Joseph, Montreal, Que., Canada, OP

Mahoney, Jack L., 969 Pacific St., Monterey, Calif., ALR

Mann, William H., 4 Southwick St., St. Thomas, Ont., Canada, OALR

Martinez-Roig, Hugo E., 730 Ponce de Leon, Hato Rey, Puerto Rico, OP

Mayer, H. Richard, 302 S. Main St., Hightstown, N. J., OP

McGlynn, Lynn Douglas, 624 N. A St., Springfield, Ore., OP

McKenna, Ernest LaPlace, Jr., 5101 Township Line, Drexel Hill, Pa., ALR

Milner, E. L., 623 Woodlane, Little Rock, Ark., ALR

Mirikitani, Carl Mamoru, 130 N. La Cienaga Blvd., Los Angeles 48, Calif., ALR

Mitchell, Douglas Grant, 50 Church St., St. Catharines, Ont., Canada, OP

Murray, James Eldon, 1300 Bancroft, San Leandro, Calif., ALR

Nalle, Ernest, Jr., West Texas Clinic, 1312 Main, Lubbock, Texas, ALR

Nedell, Ralph Sydney, 1102 53rd St., Brooklyn 19, N. Y., ALR

Norman, Mark Lewis, 406 Medical Arts Bldg., Minneapolis 2, Minn., OP

Ottum, John Andrew, 400 Northern Bldg., Green Bay, Wis., OP

Papazian, Vartan, 144 Waterman St., Providence 6, R. I., ALR

Perraut, Louis Edward, 1712 Rhode Island Ave N.W., Washington 6, D. C., OP

Platt, George Alfred, 1351 Mt. Hope Ave., Rochester 20, N. Y., OP

Prenatt, George J., 993 Delaware Ave., Buffalo 9, N. Y., ALR

Pyper, John Edwin, 236 Ontario St., Stratford, Ont., Canada, OP

Quevedo, Julio, 15 Calle 6-59, Guatemala City 1, Guatemala, ALR

Quinn, Francis Berchmans, 15225 Vanowen St., Van Nuys, Calif., ALR

Rath, William F., Professional Bldg., Augustine Cut-Off, Wilmington 3, Del., OP

Reboton, Jose R., Madridejos, Cebu, Philippines, OP

Ritter, Frank Nicholas, University Hospital, Ann Arbor, Mich., ALR

Ross, John A. T., 384 Post St., San Francisco 8, Calif., ALR

Roth, F. Dale, 490 Post St., San Francisco 2, Calif., OP

Russman, Burton Alan, 30 N. Michigan Ave., Chicago 2, Ill., OP

Sabates, Felix N., Massachusetts Eye & Ear Infirmary, 243 Charles St., Boston 14, Mass., OP

Safir, Aran, Albert Einstein College of Medicine, New York 61, N. Y., OP

St. Dizier, Roger Volsy, Jr., 314 W. St. Mary Blvd., Lafayette, La., OP

Sardi, Carl Anthony, 1100 Olive St., Greensboro, N. C., ALR

Scaramella, Louis F., 7958 S. Western Ave., Chicago 20, Ill., ALR

Schlosser, Woodrow D., 3701 N. Broad St., Philadelphia 40, Pa., ALR

Schultz, Don Louis, Naval School of Aviation Medicine, Pensacola, Fla., OP

Schwartz, John Theodore, Naval Base Dispensary, Norfolk, Va., OP

Schwilk, Norman Frederick, Jr., 109 B St., APO 845 New York, N. Y., OP

Sears, Marvin Lloyd, Wilmer Institute, Baltimore 5, Md., OP

Sebastian, Eugene Francis, 921 N. Second St., Harrisburg, Pa., OP

Seftel, Daniel M., 526 Soquel Ave., Santa Cruz, Calif., ALR

Seidel, Jerry Glenn, University of Chicago Clinics, 950 E. 59th St., Chicago 37, Ill., OP

Shea, Michael, 170 St. George St., Toronto 5, Ont., Canada, OP

Sheets, John Howard, 1173 E. 42nd St., Odessa, Texas, OP

Sherman, Harry, 1465 President St., Brooklyn 13, N. Y., OP

Shore, Sydney, 60 Charlesgate West, Boston 15, Mass., ALR

Sidrys, Rimvydas, Medical Arts Bldg., Westgate Plaza, Streator, Ill., OP

Slatin, Louis, 132 S. Water, Decatur 12, Ill., OP

Slomka, Edwin B., Hunterdon Medical Center, Flemington, N. J., OP

Smathers, Charles Ralph, 1842 King St., Jacksonville 4, Fla., ALR

Smith, Joe Robert, Professional Bldg., Columbia, Mo., OP

Spurney, Robert V., U. S. Naval Hospital, Key West, Fla., OP

Statten, Page, 200 St. Clair Ave. West, Toronto 7, Ont., Canada, ALR

Steed, William Alexander, 1122 Druid Park Ave., Augusta, Ga., ALR

Stivrins, Kazimirs, 3145 O St., Lincoln, Neb., OP

Story, Stratton R., Womack Army Hospital, Fort Bragg, N. C., ALR

Sundmaker, Wilfried K. H., 202 S. 43rd St., Philadelphia 4, Pa., ALR

Swartz, Gerald, 13 S. Cayuga Rd., Buffalo 21, N. Y., OP

Szecsey, George, 101 Lafayette Ave., 1AB, Brooklyn 17, N. Y., ALR

Taggart, George Webster, Traders Bank Bldg., Hazleton, Pa., OP

Thiele, Arthur J., Jr., USAF Hospital, Andrews AFB, Washington 25, D. C., ALR

Thompson, George Alfred, 200 St. Clair Ave. West, Toronto 7, Ont., Canada, OP

Thurmond, Jack Alfred, 1021 Doctors Bldg., Charlotte 7, N. C., OP

Tinterov, Ludmil Assenov, Veterans Administration Hospital, East Orange, N. J., ALR

Updegraff, Ambrose Gavitt, 643 Sixth Ave. South, St. Petersburg, Fla., OP

Van Sandt, Jean Faint, Weber Clinic, 600 E. Main St., Olney, Ill., OP

Voorhees, Richard Leo, 1400 Foothill Dr., Salt Lake City 8, Utah, ALR

Wacha, Victor J., Jr., 3741 Stocker St., Los Angeles 8, Calif., ALR

Wahl, Milton Sol, Suite A-15, Professional Bldg., Augustine Cut-Off, Wilmington 3, Del., ALR

Waters, Raymond Oliver, Box 2275, Brooks AFB, Texas, ALR

Watson, James Edwin, 18524 Grand River, Detroit 23, Mich., OP

Watt, Russell Hyde, 309 E. Church St., Marshalltown, Iowa, OP

Weaver, Morley A., 88 Wentworth St., Hamilton, Ont., Canada, OP

Webb, Blair M., Naval Hospital NNMC, Bethesda 14, Md., ALR

Webb, Robert B., Jr., 116 S. Sycamore St., Petersburg, Va., OP

Weisman, Frederick L., 8349 Reseda Blvd., Northridge, Calif., OP

Wellman, Paul K., 614 Fincastle Bldg., Louisville 2, Ky., OP

Wiggs, Eugene Overbey, U. S. Naval Hospital, St. Albans, N. Y., OP

Wilson, W. Webb, Jackson Clinic, Jackson, Tenn., OP

Wing, Morgan Eugene, USAF Hospital, Sheppard AFB, Texas, ALR

Witt, John Edgar, 2012 17th St., Bakersfield, Calif., OP

Witzel, Samuel Hislop, 111 Simcoe St. South, Oshawa, Ont., Canada, OP

Wood, James Kenneth, 2505 Morrow, Waco, Texas, ALR

Woodward, James M., Jr., Box 2495, USAF Hospital, Andrews AFB, Washington 25, D. C., OP

Worlton, James Timbrell, 616 S. Tejon St., Colorado Springs, Colo., OP

Yurich, Eugene Leroy, 18101 E. Warren Ave., Detroit 24, Mich., ALR

Zagraniski, Raymond J., 1441 Chapel St., New Haven, Conn., OP

The following candidates have qualified for Fellowship in the Academy except in some single detail, such as certification or the signatures of sponsors. The deficiencies are expected to be made up before the Annual Business Meeting.

Chiong, Armando Tantoco, The Johns Hopkins Hospital, Baltimore 5, Md., ALR

Grom, Edward, Instituto Medico del Este, Ave. Casanova, Caracas, Venezuela, OP

Harrison, Raymond, 140 E. 54th St., New York 22, N. Y., OP

Iliades, Constantine Emanuel, 369 Roseville Ave., Newark, N. J., ALR

FOR ASSOCIATE MEMBERSHIP

Graham, Albert Bruce, Henry Ford Hospital, Detroit 2, Mich., Audiologist

Rabinovitz, Enrique Kronhein, Sinaloa 10-302, Mexico City 7, D. F., OP

Rosenberg, Philip Emanuel, Temple University Medical Center, 3401 N. Broad St., Philadelphia 40, Pa., Associate Professor of Audiology

Kangavkar, Shantinath, Metropolitan Hospital, 1901 First Ave., New York 29, N. Y., Chief Resident in Ophthalmology

PROGRAM IN BRIEF

Palmer House — Chicago

1961 Meeting

SATURDAY, OCTOBER 7

9:00 a.m.—Council Meeting — Private Dining Room 4

SUNDAY, OCTOBER 8

9:00 a.m.—Registration—Foyer to Grand Ballroom

9:00 a.m.—Ladies' Registration—Room 834

9:00 a.m.—Official Opening of Exhibits: Scientific—Private Dining Rooms 15, 16, 17; Club Foyer
Technical—Exhibition Hall and Red Lacquer Room, Private Dining Rooms 14 and 18, and Seventh Floor

10:00 a.m.—Teachers' Section: Ophthalmology—Grand Ballroom

10:00 a.m.—Teachers' Section: Otolaryngology—State Ballroom

12:30 p.m.—Home Study Faculty Luncheon—Private Dining Room 9

4:30 p.m.—President's Reception—Grand-State Ballroom

8:00 p.m.—Special Scientific Program: Otosclerosis Study Group of the Committee on Conservation of Hearing—Grand Ballroom

8:00 p.m.—Special Scientific Program: American Orthoptic Council and American Association of Orthoptic Technicians—State Ballroom

8:00 p.m.——Special Scientific Program: Academy Committee on Head and Neck Surgery—Crystal Room

MONDAY, OCTOBER 9

7:30 a.m.—Faculty Buffet Breakfast—Victorian Room

9:00 a.m.—Orthoptic Technicians Instruction Courses—Seventh Floor

9:30 a.m.—Joint Scientific Session—Grand-State Ballroom

10:15 a.m.—Orthoptic Technicians Instruction Courses—Seventh Floor

11:30 a.m.—Orthoptic Technicians Instruction Courses—Seventh Floor

2:00 p.m.—Section on Otolaryngology: Scientific Papers and Motion Pictures —Grand-State Ballroom

2:00 p.m.—EYE Instruction Courses—Seventh Floor and Crystal Room

3:15 p.m.—EYE Instruction Courses — Seventh Floor and Crystal Room

4:30 p.m.—EYE Instruction Courses — Seventh Floor

7:00 p.m.—Annual Banquet — Grand-State Ballroom

TUESDAY, OCTOBER 10

9:00 a.m.—Section on Ophthalmology: Scientific Papers and Motion Pictures —Grand-State Ballroom

9:00 a.m.—ENT Instruction Courses — Seventh Floor and Crystal Room

9:00 a.m.—Orthoptic Technicians Instruction Courses—Seventh Floor

10:15 a.m.—ENT Instruction Courses — Seventh Floor and Crystal Room

10:15 a.m.—Orthoptic Technicians Instruction Courses—Seventh Floor

11:30 a.m.—ENT Instruction Courses—Seventh Floor

11:30 a.m.—Orthoptic Technicians Instruction Courses—Seventh Floor

2:00 p.m.—Section on Otolaryngology: Scientific Papers and Motion Pictures —Grand-State Ballroom

2:00 p.m.—EYE Instruction Courses — Seventh Floor and Crystal Room

3:15 p.m. EYE Instruction Courses — Seventh Floor and Crystal Room

4:30 p.m.—EYE Instruction Courses — Seventh Floor and Crystal Room

5:30 p.m.—Dinner Meeting of International Association of Secretaries of Ophthalmological and Otolaryngological Societies—Private Dining Room 9

8:00 p.m.—Special Scientific Program: Committee on Plastic Surgery, Ophthalmology—Grand Ballroom

8:00 p.m. Special Scientific Program: Committee on Plastic Surgery, Otolaryngology—State Ballroom

WEDNESDAY, OCTOBER 11

9:00 a.m. Section on Ophthalmology: Scientific Papers and Motion Pictures —Grand-State Ballroom

9:00 a.m.—ENT Instruction Courses — Seventh Floor and Crystal Room

10:15 a.m.—ENT Instruction Courses — Seventh Floor and Crystal Room

11:30 a.m.—ENT Instruction Courses — Seventh Floor

12:45 p.m.—Council Meeting Luncheon—Private Dining Room 5

2:00 p.m.—Section on Otolaryngology: Scientific Papers and Motion Pictures —Grand-State Ballroom

2:00 p.m.—EYE Instruction Courses — Seventh Floor and Crystal Room

3:15 p.m.—EYE Instruction Courses — Seventh Floor and Crystal Room

4:30 p.m.—EYE Instruction Courses — Seventh Floor and Crystal Room

6:30 p.m.—Alumni Functions, unless otherwise noted

THURSDAY, OCTOBER 12

9:00 a.m.—Section on Ophthalmology: Scientific Papers and Motion Pictures —Grand-State Ballroom

9:00 a.m.—ENT Instruction Courses — Seventh Floor

10:15 a.m.—ENT Instruction Courses — Seventh Floor

11:30 a.m.—ENT Instruction Courses — Seventh Floor and Crystal Room

2:00 p.m.—Section on Otolaryngology: Scientific Paper and Motion Pictures — Grand-State Ballroom

2:00 p.m.—EYE Instruction Courses — Seventh Floor

3:15 p.m.—EYE Instruction Courses — Seventh Floor

4:30 p.m.—EYE Instruction Courses — Seventh Floor

5:30 p.m.—Business Meeting—Crystal Room

FRIDAY, OCTOBER 13

9:00 a.m.—Section on Ophthalmology: Scientific Papers and Motion Pictures — Grand-State Ballroom

SCIENTIFIC SECTIONS

JOINT SESSION

Monday, October 9, 1961

9:30 a.m.

GRAND BALLROOM

Presiding Officer:

DOHRMANN K. PISCHEL, M.D.
President

Secretary:

KENNETH L. ROPER, M.D.

Call to Order.....The President

Announcements Earl H. Merz, M.D.
Co-Chairman, Local Committee

Introduction of the Guest of Honor
Peter C. Kronfeld, M.D.
Chicago, Illinois

Address by the President
Some Problems Facing the Academy

Address by the Guest of Honor
A 1961 Cross Section Through Ophthalmology

Presentation of Honor Awards

RECIPIENTS OF HONOR AWARDS FOR 1961

Elmer J. Ballintine
Cleveland

Graham Clark
New York

Claude C. Cody, III
Houston

John F. Daly
New York

John A. Egan
Denver

Olga Ferrer
Miami

Bernard Fread
New York

Deane C. Hartman
Los Angeles

Kenneth C. Johnston
Chicago

William P. McGuire
Winchester, Virginia

James A. Olson
Detroit

George F. Reed
Boston

Manuel L. Stillerman
Chicago

C. Dwight Townes
Louisville, Kentucky

C. William Weisser
Pittsburgh

John P. Wendland
Minneapolis

SYMPOSIUM: OCCLUSIVE CEREBROVASCULAR DISEASE

Diagnostic and Surgical Considerations in Occlusive Cerebrovascular Disease

Elisha S. Gurdjian, M.D.
Detroit
BY INVITATION

Ocular Aspects of Cerebral Vascular Occlusive Disease

Robert W. Hollenhorst, M.D.
Rochester, Minnesota

Surgical Techniques in the Treatment of Cerebral Vascular Occlusive Disease

John M. Lore, Jr., M.D.
Suffern, New York

SECTION ON OTOLARYNGOLOGY

Monday, October 9, 1961

2:00 p.m.

GRAND BALLROOM

Presiding Officer:
FREDERICK T. HILL, M.D.
Vice-President

Secretary:
CLAIR M. KOS, M.D.

Presentation of Awards by Committee on Research in Otolaryngology

RECIPIENTS OF AWARDS

D. Thane Cody, M.D.

Albert J. Harris, M.D.

Louis W. Welsh, M. D., and

John J. Welsh, M.D.

Frederick L. Dey, M.D.

AUTHORS OF PAPERS

All slides or films must be in the hands of the projection operator before the opening of each session.

Please be prepared to submit papers to the recorder immediately following presentation.

2:05 p.m.

NEUROCHRONAXIC THEORY OF VOICE PRODUCTION AND THE MECHANISM OF THE FALSETTO
(A Motion Picture)

Henry J. Rubin, M.D.
Beverly Hills, California

2:35 p.m.

PREDICTIVE MEASURES FOR HEARING AID EVALUATION

Jack L. Bangs, Ph.D.
Houston, Texas
BY INVITATION

The present study was designed to investigate the ability of patients to select hearing aids by subjective evaluations and to relate the selections to certain electroacoustic and audiologic phenomena.

Thirty-four patients were subjected to standard audiologic procedures and were then given five hearing aids to evaluate in terms of their fidelity as reproducing instruments. Each patient chose one hearing aid that he considered best and one that he considered poorest.

Measures were made of the frequency response, gain, and harmonic distortion in the aids and of the speech discrimination afforded by each instrument.

The results of the study indicate that the patients chose aids with a significantly wider frequency response and with lower distortion products.

No relationship between the physical measures of the hearing aids and their efficacy as reproducing instruments for speech discrimination was found, but these results must be tenured by the environment under which the testing was done.

3:00 p.m.

TRANS-SPHENOIDAL HYPOPHYSECTOMY: COMBINED SEPTAL AND ETHMOIDAL APPROACH

Mr. Geoffrey H. Bateman
London, England

BY INVITATION

The technique of operation will be discussed. The relative advantages and disadvantages of the various approaches will be brought forward for discussion.

The instruments needed for the operation will be shown and their use explained.

The types of cases already operated on will be mentioned. These include: secondary carcinoma of the breast, pituitary tumors, cerebrospinal rhinorrhoea following yttrium implants into the pituitary fossa, and diabetic retinitis. Other possible applications of the operation will be discussed.

The difficulties encountered in the operation and in the aftercare of the patients will be detailed.

3:30 p.m.

CINE-PANEL: PROBLEM CASES IN HEAD AND NECK SURGERY

Moderator:

John Conley, M.D.
New York

Panelists:

Frank D. Lathrop, M.D.
Boston
Alden H. Miller, M.D.
Los Angeles
Daniel C. Baker, Jr., M.D.
New York
Frank Batley, M.D.
Syracuse, New York

BY INVITATION

An interrupted motion picture of six problems in neoplastic disease of the head and neck will be presented to the panel. After each case is shown, the moderator will quiz the panelists in an effort to work out the best solution. This presentation is sponsored by the American Society for Head and Neck Surgery.

SECTION ON OPHTHALMOLOGY

Tuesday, October 10, 1961

9:00 a.m.

GRAND BALLROOM

Presiding Officer:
MAYNARD C. WHEELER, M.D.
Vice-President

Secretary:
KENNETH L. ROPER, M.D.

AN UNUSUAL CASE OF HUMAN POROCEPHALIASIS (PARASITE IN ANTERIOR CHAMBER)
(A Clinicopathologic Case Report)

W. Banks Anderson, M.D.

Shaler S. Roberts, Jr., M.D.
Durham, North Carolina

One month prior to examination a white spot was observed by relatives in the anterior chamber of the eye of a 16-year-old Negro boy. There was no history of antecedent pain. The eye was noticeably inflamed. On examination a white truncated object approximately 6 mm. in length was found floating free in the anterior chamber.

The cornea was clear. There was no evidence of inflammatory reaction. Vision before and after removal was 20/20. This object was easily identified as a parasite. Removal was uncomplicated, the intact specimen being available for study.

The parasite has been identified as the unencapsulated third-stage larval pentastomid, **Linguatula serrata** Frolich. These tongue worms are usually classified as aberrant arachnids. The adults live in the nasal passages of flesh-eating animals such as dogs and less frequently are found in birds. Eggs from the host contaminate the food of a secondary host, in this case the patient. The case is of interest as a medical oddity and as evidence of the high tolerance of the eye to a living parasite of relatively immense size.

9:10 a.m.

USES OF THE PERILIMBAL SUCTION CUP IN OPHTHALMOLOGY

Miles A. Galin, M.D.

Irving Baras, M.D.

John M. McLean, M.D.
New York

Discusser:

Maurice Langham, Ph.D.
Baltimore

BY INVITATION

The perilimbal suction cup is a simple device that may be employed quantitatively in measurements of aqueous flow and outflow resistance. The cup is placed on the intact globe and 50 mm. Hg of negative pressure applied. Episcleral drainage is thus occluded. During this application, intraocular pressure will rise as aqueous flow continues. The volume of fluid necessary to cause this rise in intraocular pressure may readily be determined from a Friedenwald nomogram.

Once the intraocular pressure has risen, the time necessary to reach presuction levels is a measure of the eye's outflow resistance. If this time is prolonged, the resistance is presumed to be high and, conversely, if the fall in pressure is rapid, the resistance is presumed to be low. If more rigorous values for outflow resistance are desired, calculations of outflow facility may be made utilizing the data obtained with the suction cup. Suction decay time is a simple and reproducible clinical tool for such measurements.

9:30 a.m.

EXPERIMENTAL STUDIES ON EXOPHTHALMOS
(XVIII Jackson Memorial Lecture)

George K. Smelser, Ph.D.
New York

10:30 a.m.

EXENTERATION OF THE ORBIT WITH TEMPORALIS MUSCLE TRANSPLANT (NAQUIN) (A Motion Picture)

Algernon B. Reese, M.D.
New York

Two techniques are shown: (1) when the conjunctiva can be preserved, a socket can be restored at the time of the exenteration and a prosthesis worn in a matter of weeks; (2) when the conjunctiva must be sacrificed, a socket is restored later and a prosthesis worn.

10:45 a.m.

FAMILIAL BILATERAL ESSENTIAL ATROPHY OF THE IRIS

Jerome V. Blum, M.D.

BY INVITATION

and

James H. Allen, M.D.

Monte G. Holland, M.D.
New Orleans

Discusser:

Walter H. Benedict, M.D.
Knoxville, Tennessee

Several authors have reported that essential iris atrophy is a disease of one eye; however, a few authors such as Lohlein and Gazala have reported that the disease affects both eyes. A search of the literature failed to uncover any documented hereditary bilateral examples of the disease.

The purpose of this presentation is to offer evidence that in some cases heredity may play a role and to support the concept that essential iris atrophy can be bilateral.

Three members of a family (ages 10, 13, and 16 years) have been followed for the past six years in the Department of Ophthalmology at Tulane University Medical School for bilateral essential atrophy of the iris with secondary glaucoma. In all three cases there have been progressive atrophic iris changes with absence of inflammatory stigmata. Gonioscopy revealed the angles to be closed and the iris to be attached to the trabecular meshwork and posterior cornea. In only one case has the intraocular pressure been consistently controlled below 21 mm. Hg in each eye on medical or surgical managment.

In the remaining five members of the family, a similar disease process was found in the father and one other sibling. In 1940 at another hospital, the father had been diagnosed as having essential iris atrophy with glaucoma. The sibling, age 17 years, when first examined showed only a deep iris crypt in the left eye with a normal intraocular pressure. However, in the past two years three small areas of iris stromal atrophy have developed. The intraocular pressure has remained within normal limits without therapy.

11:10 a.m.

THE MANAGEMENT OF TOXICITY FROM LOCAL ANESTHETICS

John S. Lundy, M.D.
Chicago

BY INVITATION

Certain conditions must be met in order to gain control over the clinical use of local anesthetics.

1. History of sensitivities, especially from prior experiences
2. Examination for condition of mind and body
3. Preoperative preparation
   a. Mental, use of suggestion and assurance
   b. Medication, for mood and prophylaxis against untoward effects of local anesthetic
   c. Fever, if present, to be lowered
4. Support for special postures and procedures
   a. Mechanical
   b. Vasopressure
   c. Blood loss
   d. Body comfort—air conditioning, electric fans, etc.
5. Complications
   a. Convulsions, controlled by barbiturates, muscle relaxants, oxygen and stimulants
   b. Anaphylactic edema
   c. Shock
   d. Cardiac arrest

The timing and doses used will be discussed.

11:30 a.m.

TIME-LAPSE CINEMATOGRAPHY OF TOXOPLASMA GONDII IN TISSUE CULTURE
(A Motion Picture)

Michael J. Hogan, M.D.
and
Chieko Yoneda, M.D.

BY INVITATION

San Francisco

This phase-contrast time-lapse motion picture shows the growth of the Hi strain of Toxoplasma gondii in a culture of embryonic rabbit kidney epithelium. Soon after inoculation these organisms can be seen to move in a slow, undulating manner, and to penetrate cells with their pointed end. Division by binary fission occurs repeatedly, and rupture of the cells causes liberation of masses of organisms into the culture fluid. Rosette-like structures form

in some cells. Continued development of the rosettes leads to cyst formation. At the commencement of cyst formation the organisms become smaller, but multiplication does not cease. Addition of Daraprim to the culture medium ordinarily causes death only of the organisms, both intracellular and extracellular. Under the conditions of tissue culture, both the cultured cells and the organisms are damaged irreparably by the Daraprim.

11:40 a.m.

STERILIZATION OF TONOMETERS

Ronald M. Wood, Ph.D.
Baltimore

BY INVITATION

Discusser:

Henry F. Allen, M.D.
Boston

A thorough study has been made of the techniques to sterilize tonometers. This includes an evaluation of the effectiveness, simplicity, durability, time consumption, cost and damage to the tonometer by the techniques of sterilization.

No method previously described was found to be satisfactory in all of these requirements.

A new approach was taken which resulted in the development of a thin, sterile, disposable membrane to enclose the footplate, plunger and barrel of the tonometer.

Laboratory and clinical findings are presented which show that the membrane does not alter tonometer accuracy. The membrane acts as a physical barrier between the tonometer and the eye to prevent infection.

11:55 a.m.

THE MANAGEMENT OF PTERYGIA

George M. Haik, M.D.
New Orleans

Discusser:

Guillermo Pico, M.D.
San Juan, Puerto Rico

A review of 400 cases over a 10-year period, including a study of the etiology, pathology, and surgery, with and without beta radiation.

SECTION ON OTOLARYNGOLOGY

Tuesday, October 10, 1961

2:00 p.m.

GRAND BALLROOM

Presiding Officer:
LELAND HUNNICUTT, M.D.
Vice-President

Secretary:
CLAIR M. KOS, M.D.

TYMPANOSCLEROSIS: BENIGN AND DESTRUCTIVE FORMS

Irwin Harris, M.D.
Los Angeles

There is strong evidence indicating that the lesions of tympanosclerosis may be invasive as well as superficial. The benign form (sclerosing mucositis) leaves an intact mucosa or mucoperiosteum. The destructive form (osteoclastic mucoperiostitis) respects no boundaries but invades and destroys bone as well as soft tissue. It is suggested that each type of disease requires individual consideration and management.

2:30 p.m.

SURGERY OF NASOPHARYNGEAL FIBROMAS

Joel J. Pressman, M.D.
Los Angeles

This paper will deal with the problem of nasopharyngeal fibromas insofar as surgical techniques are concerned. Two cases will be presented, each of unusual interest. One represents the removal of an extremely large nasopharyngeal fibroma as a single specimen. The details of the technique used will be presented.

A second case is of unusual interest, since a large number of unsucessful previous operations had been attempted elsewhere, but each had to be discontinued because of bleeding. In the interval between operations, severe hemorrhages, which required permanent packing through a palatal defect, had continued. Numerous serious infections resulted. Successful removal was accomplished by the technique described above supplemented with hypothermia. Despite previous failures on a number of occasions, as noted above, the removal under hypothermia was accomplished without the need to administer a single unit of blood. Further details will be given in the presentation.

3:00 p.m.

ROUND WINDOW INJURY: AUDITORY BEHAVIORAL AND ELECTROPHYSIOLOGICAL CONSEQUENCES IN THE CAT

F. Blair Simmons, M.D.
Palo Alto, California

BY INVITATION

Robert D. Burton, M.D.
Grand Rapids, Michigan

and

Dana Beatty
Palo Alto, California

BY INVITATION

Animals with electrodes permanently implanted on or near the round window and trained to respond to tones at threshold in a shuttle-box were used to explore the immediate and long-term effects of varying degrees of surgical trauma to the round window membrane. Serial measurements of the cochlear microphonic, eighth nerve action potential, and threshold audiograms (0.5 - 8 Kc) were obtained for several weeks before and after round-window damage. Variation in the degree of cochlear potential loss immediately after damage was directly related to the amount of perilymph lost. Healing, as evidenced by complete recovery of potentials, occurred in one to four weeks. Audiograms reached preoperative levels within two weeks. Cats showing signs of infection following trauma did not recover.

3:20 p.m.

QUIZ PANEL:

PROBLEMS IN RHINOPLASTY

Moderator:

John Marquis Converse, M.D.
New York

Panelists:

Jack R. Anderson, M.D.
New Orleans

Oscar J. Becker, M.D.
Chicago

John T. Dickinson, M.D.
Pittsburgh

William C. Huffman, M.D.
Iowa City

This session will be devoted to the presentation of problem cases which will be discussed by the members of the panel, who will present individually their concept of treatment.

SECTION ON OPHTHALMOLOGY

Wednesday, October 11, 1961

9:00 a.m.

GRAND BALLROOM

Presiding Officer:
DOHRMANN K. PISCHEL, M.D.
President

Secretary:

KENNETH L. ROPER, M.D.

MECHANICAL SEPARATION OF THE PARS PLANA FROM THE SCLERA IN A CASE OF GLAUCOMA SECONDARY TO ESSENTIAL ATROPHY OF THE IRIS

(A Clinicopathologic Case Report)

William B. Clark, M.D.

and

Aeleta N. Barber, Ph.D.

BY INVITATION

New Orleans

This is a presentation of two experimental surgical procedures for separating the pars plana portion of the ciliary body from the sclera to decrease the amount of aqueous formation in a case of essential atrophy of the iris with secondary glaucoma. Prior surgical procedures included large basal iridectomy and cyclodialysis. The presentation will be illustrated by slides of pathological sections of this eye.

9:10 a.m.

OCULAR MANIFESTATIONS OF NASOPHARYNGEAL TUMORS

J. Lawton Smith, M.D.

and

John A. Wheliss, M.D.

BY INVITATION

Durham, North Carolina

Discusser:

Kenneth D. Devine, M.D.
Rochester, Minnesota

This is a review of 53 cases of histologically proven malignant nasopharyngeal tumors encountered at Duke Hospital between 1930 and 1960. Analysis of the following factors has been made: age, sex, race, chief complaint, other pertinent history, positive findings on physical examination, weight loss, pain in the face, serous otitis media, eye consultation, eye findings, visual acuity, proptosis, findings on nasopharyngoscopy, histologic findings, roentgen therapy, and subsequent course and follow-up.

The occurrence of eye abnormalities in 57 per cent of the cases in this series corroborates the importance of the ophthalmologist in the detection of malignant nasopharyngeal tumors.

9:40 a.m.

CONTACT LENSES: A SYMPOSIUM

Introduction

Elizabeth F. Constantine, M.D., Moderator
New York

Definition; Anatomy and Physiology of the Cornea

Robert L. Tour, M.D.
San Francisco

Optics
Fusion in Monocular Aphakia

Hermann M. Burian, M.D.
Iowa City

Clinical Procedure

Chester J. Black, M.D.
Elmhurst, Illinois

Pathology

Philip G. Spaeth, M.D.
Philadelphia

Indications

Charles E. Iliff, M.D.
Baltimore

11:40 a.m.

CATARACT EXTRACTION WITH ZONULOLYSIS (Including a Motion Picture)

Ricardo F. Fernandez, M.D.
Rafael O. Fernandez, M.D.
San Juan, Puerto Rico

This presentation comprises a color film demonstrating the technique of cataract extraction with zonulolysis presently used by the authors at the Eye Institute of Puerto Rico, and a statistical comparison of the results and complications in a series of 100 consecutive cases of cataract extraction with zonulolysis performed during the year 1960, and the previous 100 cases of cataract extraction without zonulolysis performed by the authors at the same institution.

11:55 a.m.

POLYOPIA CAUSED BY EXCESSIVE SECRETION FROM THE MEIBOMIAN GLANDS

Robert W. Hollenhorst, M.D.
John A. Dyer, M.D.
Rochester, Minnesota

Discusser:

James E. Lebensohn, M.D.
Chicago

Visual disturbances produced by dysfunction of the meibomian glands are probably more common than generally known. Excessive oily secretion caused disabling polyopia in both eyes of each of the three patients included in this report. Two of the three patients also had moderate keratoconjunctivitis sicca. A characteristic reduplication of observed images was produced. Treatment consisted of periodic digital evacuation of the glands, warm moist compresses, and instillation of methyl cellulose solution.

12:10 p.m.

FLORIFORM CATARACT: A REVIEW OF THE LITERATURE AND REPORT OF THREE ADDITIONAL CASES IN ONE FAMILY

Irwin S. Terner, M.D.
Pittsburgh

Discusser:

Robert J. Masters, M.D.
Indianapolis

Floriform cataract was first described by Vogt in 1922. One year later, Koby, a former student of Vogt, described in great detail this type of cataract. Since then little has appeared in the literature concerning this type of lens opacity. It is a rare developmental cataract having a familial tendency and consists of many small doughnut-shaped opacities which are arranged in the form of petals of a flower. The opacities are related to the suture system and may be a transitional form between suture cataract and coronary cataract.

Three cases of bilateral floriform cataract occurring in a 32-year-old white woman and her two daughters, ages 8 and 6 years, will be presented. In these cases it appears that the lesions are progressive insofar as the density is concerned. It may be predicted with some certainty that in time, the visual acuity of the children will further diminish in a manner similar to that which occurred in the mother.

Both lenses of the mother were extracted intracapsularly. One of these lenses is being studied at the Armed Forces Institute of Pathology for a clue as to the chemistry of the lesion.

SECTION ON OTOLARYNGOLOGY

Wednesday, October 11, 1961

2:00 p.m.

GRAND BALLROOM

Presiding Officer:

FREDERICK T. HILL, M.D.
Vice-President

Secretary:

CLAIR M. KOS, M.D.

PRESENTATION OF NEW INSTRUMENTS

2:30 p.m.

PROCUREMENT OF TEMPORAL BONES

Part I: Progress Report on a Temporal Bone Bank Program for Ear Research

Howard P. House, M.D.
Los Angeles

The report will include a description of the system which has proved effective in developing a temporal bone bank program for ear research and a description of the progress which has been made to date in the recovery of temporal bones with documented hearing defects.

Part II: The Temporal Bone Banks for Ear Research Program Developed Under the Sponsorship of the American Academy of Ophthalmology and Otolaryngology with the Support of the Deafness Research Foundation

John R. Lindsay, M.D.
Chicago

A general description will be presented of the program which has been put into operation for the pledging of temporal bones for ear research on the part of patients with documented hearing and vestibular disorders, including a description of the function of the temporal bone bank center and of the plans for the procurement and processing of temporal bones which are recovered under the program.

2:45 p.m.

FOREIGN BODIES IN THE AIR AND FOOD PASSAGES
(Includes Motion Picture)
(XVII Wherry Memorial Lecture)

Paul H. Holinger, M.D.
Chicago

3:30 p.m.

SUBMAXILLARY SALIVARY FLOW: A TEST OF CHORDA TYMPANI NERVE FUNCTION AS A BASIS FOR SURGICAL INTERVENTION IN BELL'S PALSY
(Includes Motion Picture)

Irving M. Blatt, M.D.
New Orleans

Fifty patients with Bell's palsy (ideopathic peripheral facial paralysis) between the ages of 5 and 72 years have been studied by electrodiagnostic and submaxillary salivary flow—chorda tympani methods—in an effort to find a reliable test which can readily distinguish those patients who will recover spontaneously from those who will require surgical decompression. Electromyography was used as a control study in twenty-two patients, or approximately fifty per cent.

3:45 p.m.

TYMPANOPLASTY: A SYMPOSIUM

Joseph A. Sullivan, M.B., F.R.C.S. (C)
Toronto, Canada
Moderator

A Critical Review of Tympanoplasty

Woodrow D. Schlosser, M.D.
Philadelphia

BY INVITATION

In the past, the treatment of chronic otitis media has generally involved radical mastoid surgery. Because of certain postoperative complications and the hearing loss resulting from this surgery, the modified radical mastoidectomy technique was developed. This procedure permitted the preservation or even improvement of hearing in the ear operated upon.

More recently, interest has centered upon the development of surgical techniques aimed at the plastic reconstruction of the tympanic membrane and ossicular chain damaged by disease in order to increase the number of patients given an improvement in hearing as well as a dry ear. Since the advent of the various tympano-

plasty procedures, it might appear that emphasis has been placed upon the improvement of hearing rather than on the control of the disease. It is the intent of this report to question this approach and to suggest that the aims of tympanoplastic surgery must be the same as those of the older mastoid procedures, namely, control the disease first; then seek to improve the hearing sensitivity.

Experience with a large series of tympanoplastic procedures supports the contention that control of disease must be the primary surgical aim. It now is held that extensive mastoid surgery involving various skin grafting procedures combined with muscle graft implants to obliterate the mastoid bowl gives promise of providing the best single answer to the twofold purpose of tympanoplasty surgery.

Grafting Techniques and the Pedicle Meatal Graft

(Includes Motion Picture)

Houston L. Bell, M.D.
Roanoke, Virginia

A review of the bibliography on grafting techniques is made, beginning with the pedicle grafts which Moritz used prior to the free grafting techniques of Wullstein and Zollner. Types of vein graft techniques for repair of the tympanic membrane are mentioned. Special attention is given to the use of tympanomeatal skin for grafting the tympanic membrane by the pedicle technique. The indications and limitations of the vein grafting technique are brought out, and the indications and special advantages of the pedicle meatal graft are emphasized. The technique and procedure for preparing the tympanomeatal pedicle graft are discussed in detail. Postoperative care is given some attention as well as the complications which one encounters in pedicle grafting.

A short motion picture showing the preparation of the graft and its application to the donor site will be shown.

Radical Mastoidectomy Without Postoperative Cavity

Ben H. Senturia, M.D.
St. Louis

One of the most perplexing problems following the usual mastoidectomy is the postoperative care of the mastoid bowl. Despite meticulous microsurgery and skin grafting, recurrent infections and granulations develop postoperatively, requiring extended office care. Recently, modified surgical techniques have been recommended by Rambo and Guilford for the obliteration of the mastoid cavity. This author contends that best results may be obtained by radical mastoidectomy in which the postoperative cavity is sealed off from the external auditory canal.

The procedure consists of the usual radical mastoidectomy except that great care is taken to preserve the skin of the external auditory canal. If it is necessary to visualize the middle ear, a coronal incision is made into the skin of the ear canal at 12 o'clock and then just lateral to the annulus, and the resulting pedicle is rotated into the mastoid. At the completion of the mastoid and middle ear surgery the skin of the ear canal is returned to its original position and maintained in place by anterior and posterior packing. Postoperatively, the mastoid cavity is lined by mucoperiosteum in continuity with the middle ear, very much like an enlarged mastoid antrum.

Complete data are available on fourteen patients who have had mastoidectomy without a postoperative cavity and who have been observed during their postoperative course from three months to three years. Despite this "radical innovation," all ears without exception are dry and there have been no complications. The hearing levels are commensurate with those observed in cases treated by the classical techniques. Cultures of the external and middle ears have returned to normal within the usual period of time. No secondary operation has been necessary.

Pitfalls of Tympanoplasty

(Includes Motion Picture)

Seymour J. Brockman, M.D.
Los Angeles

Experience and long range evaluation of cases has proven that there are definite contraindications to tympanoplasty either as a primary or secondary procedure.

1. Diffuse cholesteatosis — primarily pediatric, occasionally adult
2. Tympanosclerosis—osteoclastic form
3. Fixed stapes
4. Atrophic mucosa of middle ear

5. Local manifestation of systemic illness, such as tuberculosis
6. Nonfunctioning or poor functioning eustachian tube
7. Acute infection of temporal bone
8. Persistent upper respiratory manifestations, such as allergy, sinusitis, endocrinopathy, infections, septal deviations
9. Significant sensorineural defects
10. Nonfuctioning round window

SECTION ON OPHTHALMOLOGY

Thursday, October 12, 1961

9:00 a.m.

GRAND BALLROOM

Presiding Officer:
MAYNARD C. WHEELER, M.D.
Vice-President

Secretary:
KENNETH L. ROPER, M.D.

NARROW ANGLE GLAUCOMA (A Clinicopathologic Case Report)

Leonard Christensen, M.D.
Portland, Oregon

The patient to be presented developed a narrow angle and angle closure glaucoma within a few days. A histologic comparison of the anterior segments between this eye and a specimen with classical acute congestive narrow angle glaucoma shows no significant difference. In both, the anterior vitreous is displaced forward. The vitreous seems to have displaced the lens-iris diaphragm with resultant occlusion of the chamber angles. The critical difference between the two eyes lies in the mechanisms involved in the displacement of the anterior vitreous face. A reconstruction of the sequence of events in the case to be presented suggests a possible pathogenesis of narrow angle glaucoma.

9:10 a.m.

THE CURE OF EPIPHORA DUE TO CANALICULAR DISORDERS, TRAUMA AND SURGICAL FAILURE ON THE LACRIMAL PASSAGES

Lester T. Jones, M.D.
Portland, Oregon

Discussers:

J. Vernal Cassady, M.D.
South Bend, Indiana

Everett R. Veirs, M.D.
Temple, Texas

Present methods for the cure of epiphora due to obstruction of the nasolacrimal duct in infancy and old age are quite successful. Even the canaliculorhinostomy is successful in a majority of cases in which there is no stenosis lateral to the internal common punctum. But there remains a large group, perhaps 20 per cent, for which the physician has no cure to offer or in which a surgical procedure is considered too difficult or hazardous to attempt. This paper will be limited to a discussion of this latter group of cases.

Conservative treatment of the canaliculi, partial and complete acquired obstruction, and congenital absence of the canaliculi will be discussed. Where no usable part of the canaliculi remains and the tear sac is found to be patent, a dacryocystorhinostomy is done with the insertion of a glass tube through a stab wound from the conjunctiva at the medial commissure to the center of the sac. Where there is no sac, the bony wall of the lacrimal fossa is removed and a glass tube is inserted as before except that the inner end lies in the anterior extremity of the middle meatus of the nose.

After a year and a half to two years the new passage will lose its tendency to close and the glass tube may be discarded.

9:40 a.m.

THE VALUE OF PERIMETRY AS A DIAGNOSTIC AID: A SYMPOSIUM

Statement of the Aims of Perimetry

David O. Harrington, M.D.
San Francisco

Requirements of a Satisfactory Perimetric Technique, Including Instrumentation and the Uses of Perimetry in Ocular and Neurological Diseases

Placidus J. Leinfelder, M.D.
Iowa City

Analysis of Visual Field Defects by Quantitative Methods to Obtain the Most Possible Information from Areas of Established Visual Loss

David O. Harrington, M.D.

Demonstration of Specific Visual Field Defects in Ocular and Neurological Disease and Localization of Lesions Which Produce Them. Correlation of Perimetric Findings with General Signs and Symptoms of Disease States Involving the Visual Pathway

Donald J. Lyle, M.D.
Cincinnati

Closing Statement

10:40 a.m.

SEVERE CICATRICIAL ENTROPION CORRECTED BY LaGLEYZE PROCEDURE ENHANCED WITH MUCOSAL GRAFT (A Motion Picture)

Alston Callahan, M.D.
Birmingham, Alabama

Moderately severe cicatricial entropion is best corrected by the LaGleyze procedure: the lid margin with a 3 to 4 mm. tarsal strip is partly detached from the body of the lid, turned and fixed anteriorly and upward by mattress sutures suspended from the levator, inserted from the conjunctival surface.

For an ultrasevere cicatricial entropion, as may result from a chemical burn, excess conjunctival scarring, tarsal deformity from trachoma or from an improper operative procedure on a moderately severe cicatricial entropion, a mucosal graft 6 to 8 mm. wide and extended the length of the lid must be sutured to the cut tarsal edges so as to enhance the effect of the operation and to prevent postoperative contraction, which may draw the skin in around the lid margin again to cause corneal abrasion. The usual LaGleyze procedure is shown briefly on a lid which had moderately severe cicatricial entropion, and the enhanced LaGleyze with a mucosal graft is shown on the right upper lid of another patient who had sustained a burn from a piece of hot weld slag.

Postoperative results shown years later conclude the film.

10:55 a.m.

ADVANCES IN SURGERY OF THE CRYSTALLINE LENS

Joaquin Barraquer, M.D.
Barcelona, Spain

Important progress has been made in surgery of the crystalline lens during the past few years, involving improvements and advances in anesthesia, techniques producing hypotony, hemostasis, instrumentation, surgical technique, and the management of complications. The use of general anesthesia in ocular surgery is recommended and the importance of assuring maximum hypotony is emphasized. A number of instruments are described in detail (galvanocautery; blepharostat of J. I. Barraquer; corneal scissors of J. I. Barraquer, Castroviejo and Troutman; Flieringa-Bonaccolto scleral ring; double-needle of J. I. Barraquer). The author insists particularly on the correct placing of multiple virgin silk sutures and the importance of microscopic control of the operation. In surgical technique the introduction of enzymatic zonulolysis has marked an important step forward, and the author emphasizes the fact that the classical operative techniques must be adapted to the use of enzymatic zonulolysis in order to avoid complications. In children, extracapsular extraction still remains the method of choice. The major complication in surgery of the crystalline lens is vitreous loss; advances that have been made in the techniques dealing with this accident are described in detail.

11:35 a.m.

THE EFFECT OF PERIPHERAL VASOCONSTRICTOR AND VASODILATOR DRUGS ON THE INTRAOCULAR BLOOD VOLUME

Jerome W. Bettman, M.D.

Victor G. Fellows, Jr., M.D.
San Francisco

Discusser:

Irving J. Leopold, M.D.
Philadelphia

Many ophthalmologists administer drugs that are peripheral vasodilators in an attempt to increase the volume of blood in the eye. Our studies of several years on experimental animals (mostly cats) demonstrate that peripheral vasodilators which are truly effective (examples: methacholine, nylidrin) actually diminish the intraocular blood volume. Certain peripheral vasodilators produced little or no effect (example: nicotinic acid).

Effective vasoconstrictors (examples: epinephrine, levoarterenol) caused a marked increase in the intraocular blood volume.

It is suggested that the use of peripheral vasodilators is contraindicated for those intraocular conditions that seem to be associated with diminished blood supply.

11:55 a.m.

BLEPHAROPOIESIS
(A Motion Picture)

Ricardo F. Fernandez, M.D.
San Juan, Puerto Rico

A color film showing reconstruction of the lower lid after total excision for carcinoma, utilizing the technique of Dr. Wendell Hughes. Silent with titles.

12:05 p.m.

PLEXIFORM NEUROMA OF THE PERIORBITAL AREA

Louis J. Girard, M.D.

and

Bromley S. Freeman, M.D.

BY INVITATION

Lazlo Maak, M.D.

BY INVITATION

Houston, Texas

Discusser:

Edith M. Parkhill, M.D.
Rochester, Minnesota

BY INVITATION

Plexiform neuroma involving the periorbital area is a relatively rare tumor; its origin is still a matter of controversy. The purpose of this communication is to present two cases of plexiform neuroma; to illustrate the morphological characteristics of this tumor, including histologic, tissue culture and electron microscopic observations; to comment on the possible nontumorous features; and to describe the clinical behavior of neuromas involving the periorbital area.

SECTION ON OTOLARYNGOLOGY

Thursday, October 12, 1961

2:00 p.m.

GRAND BALLROOM

Presiding Officer:
LELAND HUNNICUTT, M.D.
Vice-President

Secretary:
CLAIR M. KOS, M.D.

CONTINUOUS INFUSION CHEMOTHERAPY. EFFECTS OF INTRA-ARTERIAL METHOTREXATE WITH INTERMITTENT INTRAMUSCULAR CITROVORUM FACTOR THERAPY IN HEAD AND NECK CANCER

Robert D. Sullivan, M.D.
New York

BY INVITATION

A program designed to enhance the antitumor effects of cancer chemotherapeutic agents by regional administration has led to the development of the following method of therapy: The continuous 24-hour administration of an antimetabolite through a

catheter inserted into a known site in the arterial blood supply of localized forms of cancer, together with the intermittent, intramuscular administration of the specific antidote. Preliminary clinical studies were described using methotrexate (antimetabolite) and leucovorin (C. F. metabolite) in patients with incurable head and neck cancer (Cancer, 12: 1248-1262, Nov.-Dec. 1959), and carcinoma of the cervix (Cancer Chemotherapy Reports, 8:1-6, July 1960). The current presentation represents our cumulative experience with this method of therapy in patients with nonresectable head and neck cancer.

2:30 p.m.

POSTURAL VERTIGO: CLINICAL AND EXPERIMENTAL OBSERVATIONS

Harold F. Schuknecht, M.D.
Boston

Discusser:

John R. Lindsay, M.D.
Chicago

Postural vertigo of the benign paroxysmal type is a common vestibular disorder. It often occurs spontaneously with no other otologic disturbances. It is common after head injury and after traumatic ear surgery. Patients in one group with this type of vertigo have a preceding acute prolonged vestibular upset. Temporal bone studies on such patients have revealed degeneration of the superior division of the vestibular nerve and the sense organs supplied by it (Hallpike, Lindsay).

An experiment was performed in a series of animals in which the superior divisions of the vestibular nerves were sectioned and the inner ears studied to determine possible mechanisms by which postural vertigo might be produced peripherally. If postural vertigo of the benign paroxysmal type is really of peripheral origin, then the reaction must be from the posterior canal crista. Hypothetically, it seems possible that distortion of the membranous labyrinth, due to collapse of the pars superior or loose statoconia from a degenerating utricular otolithic membrane, could bend the cupula of the posterior semicircular canal.

3:00 p.m.

A HISTOLOGICAL DEMONSTRATION OF THE DEVELOPMENT OF LARYNGEAL CONNECTIVE TISSUE COMPARTMENTS

Gabriel F. Tucker, Jr., M.D.
Baltimore

and

Herbert R. Smith, Jr.
Bethesda, Maryland

BY INVITATION

The importance of the connective tissue compartments in the spread of laryngeal carcinoma has recently been emphasized. By the use of appropriately stained serial coronal sections of the whole larynx, both fetal and adult, the discrete histologic boundaries of the laryngeal compartments may be demonstrated. These findings may be correlated, not only with the localization of laryngeal carcinoma, but also with infantile "croup" or laryngotracheobronchitis.

3:30 p.m.

AN INFORMAL OTOLOGIC SEMINAR

Moderator:

Howard P. House, M.D.
Los Angeles

Panelists:

Eugene L. Derlacki, M.D.
Chicago

Frederick R. Guilford, M.D.
Houston

Harold F. Schuknecht, M.D.
Boston

Otologic case histories will be informally presented to the members of the panel, and they will be asked to discuss their management of each problem. Since the panel will be unaware of the problems to be presented, an interesting and informative discussion is anticipated.

SECTION ON OPHTHALMOLOGY

Friday, October 13, 1961

9:00 a.m.

GRAND BALLROOM

Presiding Officer:
DOHRMANN K. PISCHEL, M.D.
President

Secretary:
KENNETH L. ROPER, M.D.

TEMPORAL ARTERITIS ASSOCIATED WITH SCLERODERMA
(A Clinicopathologic Case Report)

Merrick J. Wyble, M.D.
BY INVITATION
and
Robert A. Schimek, M.D.
New Orleans

The collagen diseases and the "auto-immune" diseases are frequently of interest to the ophthalmologist. More than one of these related conditions may co-exist in the same patient.

A middle-aged Negro woman, with headaches and scleroderma clinically, had a retinal artery occlusion with vision reduced to counting fingers. After intravenous fibrinolysin, retrobulbar hydrocortisone, and cervical ganglion block, vision returned to 20/25.

Biopsy studies will be shown which confirmed the diagnosis of temporal arteritis and scleroderma co-existing in this patient. The ease with which the ophthalmologist can confirm the diagnosis of temporal arteritis by temporal artery biopsy is stressed.

9:10 a.m.

PRESENTATION OF NEW INSTRUMENTS

9:20 a.m.

DISTANT MAGNIFICATION FOR LOW VISION PATIENTS WITH APHAKIA

Gerald E. Fonda, M.D.
Short Hills, New Jersey

Donald A. Fonda, M.D.
Ridgewood, New Jersey

Discusser:

Albert E. Sloane, M.D.
Boston

Four times magnification for distance can be produced in cases of aphakia, high hyperopia and dislocated lenses by holding a +3.00 diopter lens 25 cm. before the uncorrected eye. A biconvex lens 50 mm. in diameter has been found to be the most suitable size and conflexure.

An illustrative case is presented and the theory of the magnification is explained.

9:35 a.m.

LATTICE DEGENERATION OF THE RETINA

Raymond A. Allen, M.D.
BY INVITATION
and
Bradley R. Straatsma, M.D.
Los Angeles

Lattice degeneration is a frequent precursor of retinal detachment. This form of peripheral retinal disease is characterized by circumferential areas of retinal thinning with interlacing linear markings, and is often associated with pigmentation, round holes, and retinal tears. This report illustrates the clinical features of lattice degeneration and correlates macroscopic appearance with histopathology. Various forms and degrees of lattice degeneration are portrayed and consideration is given to the relationship between this type of degeneration and the development of retinal detachment.

9:50 a.m.

HEREDITARY RETINOSCHISIS

J. Robert Fitzgerald, M.D.

James L. McCarthy, M.D.
Chicago

Discusser of this and the preceding paper:

Bayard H. Colyear, Jr., M.D.
San Francisco

Retinoschisis, a splitting of the peripheral retina in its outer plexiform layer, arises from confluence or enlargement of degenerative micropseudocysts (Blessig-Iwanoff cysts) and from chorioretinitis of varied etiologic background. Congenital and hereditary types also exist. It is characterized clinically by a nonmovable, smooth, usually asymptomatic, round, flat, or tent-like, translucent elevation of the peripheral retina that infrequently leads to retinal detachment, though it is potentially dangerous to the macula. The disease occurs more frequently than perusal of the ophthalmic literature (especially the American ophthalmic literature) would lead one to believe.

This is a report of two instances of retinoschisis occurring in a man and his mother. The 38-year-old son had had an inferotemporal retinoschisis that caused a flat retinal detachment. This was treated surgically with success. His 69-year-old mother had a nonoperable retinoschisis that occupied all but a small island of her superior peripheral retina. These two cases emphasize the hereditary aspects of this disease, heretofore not well documented.

Diagnosis and treatment are briefly outlined. Illustrations include diagrams, fundus photographs, and visual fields.

10:15 a.m.

SCLERAL BUCKLING: FULL THICKNESS AND CIRCUMFERENTIAL USING SILICONE RUBBER RODDING AND PHOTOCOAGULATION
(A Motion Picture)

Louis J. Girard, M.D.

Alice R. McPherson, M.D.
Houston, Texas

10:35 a.m.

RETINAL DETACHMENT WITH GIANT TEARS: PATHOGENESIS AND MANAGEMENT

Charles L. Schepens, M.D.

and

J. Graham Dobbie, M.D.

BY INVITATION

J. Wallace McMeel, M.D.

BY INVITATION

Boston

Discusser:

P. Robb McDonald, M.D.
Philadelphia

Pathogenesis of retinal detachment due to tears involving ninety degrees or more of the retinal circumference may be idiopathic or traumatic, or may occur along the edge of lattice degeneration.

The preoperative management aims toward unfolding the inverted retina through positioning of the patient. Surgical success is dependent upon maintaining this optimum patient position throughout surgery by the use of a specially constructed surgical stage.

Therapeutic failures include use of a spatula on the folded retina as well as injection of vitreous, saline solution, or air.

11:05 a.m.

CHRONIC GRANULOMA FOLLOWING SCLERAL BUCKLING PROCEDURES

William G. Everett, M.D.

and

Dorothy C. Scott, M.D.

BY INVITATION

Margaret C. Sharrer, M.D.

BY INVITATION

Pittsburgh

Discusser:

Charles L. Schepens, M.D.
Boston

The authors will present a series of clinical cases of chronic granuloma of the eye

which followed encircling scleral buckling operations for retinal detachment. Granulomas were observed following the use of polyethylene tubing and silicone rubber tubing with intraluminal silk sutures.

Granulomas of this type appear at the open ends of the tube. In one case in which an encircling solid silicone rod was used with two polyethylene cuffs and no intraluminal suture, typical granulomas developed at the ends of the polyethylene cuffs. Granulomas may appear any time from a few weeks to many months after surgery. Occasionally the scleral reaction is severe enough to cause a chronic inflammatory reaction of the choroid. Such granulomas have not been observed in segmental scleral buckling operations when only a section of tubing of either polyethylene or silicone is buried in the sclera.

These lesions have uniformly failed to respond to topical or systemic treatment. Removal of the tube and suture, or of the silk suture alone, will relieve the granulomas.

Experimental evidence will be presented showing similar reactions in dogs with the use of polyethylene and silicone tubes with an intraluminal silk suture buried in a scleral undermine bed, and in subcutaneous neck implants. Polyethylene and silicone tubes without intraluminal sutures and solid silicone rods did not produce granulomas in dogs. Sites of these experimental operations were examined histologically at routine intervals up to three months, and typical granulation reactions to plastic tubes with intraluminal silk will be shown.

The results of these studies led to the development of a new solid silicone rod with an incorporated mersiline suture for scleral buckling in retinal detachment surgery. Clinical use of this material for one-and-one half years has resulted in no granulomas.

11:25 a.m.

OCCURRENCE AND BEHAVIOR OF CHOROIDAL MELANOMAS IN EYES SUBJECTED TO RETINAL DETACHMENT OPERATIONS

Milton Boniuk, M.D.
Houston, Texas

BY INVITATION

and

Lorenz E. Zimmerman, M.D.
Washington, D. C.

Discusser:

Windsor S. Davies, M.D.
Detroit

This report is based on a clinicopathologic study of 57 melanoma-containing eyes that have had one or more operations for retinal detachment. The data obtained were analyzed with particular reference to those manifestations which should have suggested the possibility of a malignant melanoma earlier in the course of management. The high incidence of extraocular extension and the high mortality rate were probably due to delayed enucleation as well as to the direct effects of retinal detachment operation.

SPECIAL SCIENTIFIC PROGRAMS

These Special Programs are open meetings. All members and guests of the Academy are welcome to attend.

THE COMMITTEE FOR RESEARCH IN OTOLARYNGOLOGY FIFTH ANNUAL MEETING

Northwestern University Medical School
303 East Chicago Avenue

Saturday, October 7, 10:00 a.m.

ARAM GLORIG, M.D.
Program Chairman

Round Window Response to Sound in Central Deafness in Man

R. J. RUBEN, M.D.
J. E. BORDLEY, M.D.
Department of Otolaryngology
The Johns Hopkins University
School of Medicine

Preliminary Results with Streptomycin Effects on Sensory Cells of the Inner Ear in Vitro

MARY FAITH ORR, PH.D.
GEORGE E. SHAMBAUGH, M.D.
Tissue Culture Laboratory
Department of Otolaryngology
Northwestern University Medical School and
Chicago Wesley Memorial Hospital

The Development of Nervous Elements in the Human Larynx

WERNER F. KÖNIG, M.D.
Hals-Nasen-Ohren-Klinik der
Ruprecht-Karl-Universitat
Heidelberg, Germany

HANS VON LEDEN, M.D.
University of California at Los Angeles

Electrical Stimulation of the Eighth Nerve to Produce Hearing in Humans

WILLIAM F. HOUSE, M.D.
Los Angeles, California

Healing of Stapedial Fractures: Observations on Tissue Culture with the Tantalum Ear Chamber in Rabbits

YOUNG BIN CHOO, M.D.
GODFREY E. ARNOLD, M.D.
New York City

Effects of Electrical Stimulation on Peripheral Auditory Responses

DAN AGIN, PH.D.
Department of Physiology
University of Chicago

The Internal Structure of the Larynx

LOUIS W. WELSH, M.D.
Oxford, England
JOHN J. WELSH, M.D.
Great Lakes, Illinois

Labyrinthine DC Potentials in Representative Vertebrates

ROBERT SCHMIDT, M.D.
CESAR FERNANDEZ, M.D.
Department of Surgery
The University of Chicago

The Relationship of Reichert's Cartilage to the Facial Canal in Postnatal Stages of Development

DAVID G. HARPER
Department of Anatomy
University of Wisconsin

Further Study of the SAL Test

TOM W. TILLMAN, PH.D.
JAMES JERGER, PH.D.
GEORGE ALLEN, M.D.
Northwestern University

Contrast Radiography of the Larynx

JAMES H. FARR
Los Angeles, California

Preliminary Report on Otosclerotic Tissue Transplanted Into Animals

RICHARD JOHN BELLUCCI, M.D.
DOROTHY WOLFF, PH.D.
CHARLES D. SMITHDEAL, M.D.
Manhattan Eye, Ear and Throat Hospital

Laryngeal Reconstruction in Dogs

JOSEPH H. OGURA, M.D.
DONALD SHUMRICK, M.D.
Department of Oto-Laryngology
School of Medicine
Washington University

To be Announced

JOHN J. SHEA, M.D.
Memphis Otologic Clinic

Observations on Eustachian Tubal Function by Means of Fluorescent Dye

ROBERT L. ROGERS, M.D.
University of Kansas Medical Center

The Intraocular Effects of Nicotinic Acid on the Stria Vascularis

DAVID O. ZENKER, M.D.
College of Physicians and Surgeons
Columbia University

TEACHERS' SECTION: OTOLARYNGOLOGY

State Ballroom

Sunday, 10:00 a.m.

JOHN A. KIRCHNER, M.D.
Chairman

TRENDS IN OTOLARYNGOLOGY HERE AND ABROAD

North American Programs: Discussion of Program Director's Conference at NIH Clinical Center April, 1961

THEODORE E. WALSH, M.D.
St. Louis

WILLIAM J. MCNALLY, M.D.
Montreal

Foreign Programs: Discussion of Program Director's Conference at Paris July, 1961

JOHN E. BORDLEY, M.D.
Baltimore

LAWRENCE R. BOIES, M.D.
Minneapolis

JOHN A. KIRCHNER, M.D.
New Haven, Conn.

Open Discussion

TEACHERS' SECTION: OPHTHALMOLOGY

Grand Ballroom

Sunday, 10:00 a.m.

A. D. RUEDEMANN, M.D.
Chairman

NARROWING FIELD OF OPHTHALMIC SURGERY

Exenteration, Evisceration, Enucleation

A. D. RUEDEMANN, M.D.
Detroit

Dacryocystotomy, Dacryocystectomy, Dacryocystorhinostomy

EDMUND B. SPAETH, M.D.
Philadelphia

Glaucoma Surgery

PAUL CHANDLER, M.D.
Boston

Retinal Detachment Surgery

GRAHAM CLARK, M.D.
New York

Plastic Procedures

WENDELL L. HUGHES, M.D.
Hempstead, Long Island, N. Y.

Corneal Surgery

RAMON CASTROVIEJO, M.D.
New York

COMMITTEE ON HEAD AND NECK SURGERY

Crystal Room

Sunday, 8:00 p.m.

W. FRANKLIN KEIM, M.D.
Chairman

Newer Concepts in the Transplantation of Homografts

LYNDON A. PEER, M.D.
Newark, N. J.

Technique and Results of Perfusion of Head and Neck Neoplasms

DONALD B. ROCHLIN, M.D.
Los Angeles

BY INVITATION

Experimental Studies in Laryngeal Replacement in Dogs

JOSEPH H. OGURA, M.D.
and
DONALD A. SHUMRICK, M.D.
BY INVITATION
St. Louis

Management of Post-Cricoid Carcinoma

MAX SOM, M.D.
New York

Total Laryngectomy in Uncontrolled Aspiration Pneumonitis

GEORGE F. REED, M.D.
Boston

COMMITTEE ON CONSERVATION OF HEARING and OTOSCLEROSIS STUDY GROUP

Grand Ballroom

Sunday, 8:00 p.m.

DEAN M. LIERLE, M.D.

ARTHUR L. JUERS, M.D.
Co-Chairmen

The Use of Auditory Tests as an Aid to the Localization of Lesion

JAMES JERGER, PH.D.
Evanston, Illinois
BY INVITATION

The Diagnosis and Surgical Management of Advanced Otosclerosis

HOWARD P. HOUSE, M.D.
Los Angeles

Sensorineural Deafness Following Stapedectomy

HAROLD F. SCHUKNECHT, M.D.
Boston

Acoustic Trauma After Successful Stapedioplasty

CLAIR M. KOS, M.D.
Iowa City

Discussion

GEORGE E. SHAMBAUGH, JR., M.D.
Chicago

AMERICAN ORTHOPTIC COUNCIL and AMERICAN ASSOCIATION OF ORTHOPTIC TECHNICIANS

State Ballroom

Sunday, 8:00 p.m.

FRANK D. COSTENBADER, M.D.
President

EDMOND L. COOPER, M.D.
Secretary

Results of Pleoptic Treatment of Suppression Amblyopia

LOUIS J. GIRARD, M.D.

MARY C. FLETCHER, M.D.

EVELYN TOMLINSON

BARBARA A. SMITH
Houston

Clinical Experiences with Pleoptics

JANE ROMANIO
New York

Small Angle Esodeviations

DAN G. ALBERT, M.D.
Washington, D. C.

Small Angle Esodeviations

ANN EUSTIS
Washington, D. C.

COMMITTEE ON RECONSTRUCTIVE PLASTIC SURGERY: OPHTHALMOLOGY

Grand Ballroom

Tuesday, 8:00 p.m.

WENDELL L. HUGHES, M.D.
Chairman

ECTROPION

Introduction, including Anatomy and Physiology

F. BRUCE FRALICK, M.D.
Ann Arbor, Michigan

Senile Ectropion

SIDNEY FOX, M.D.
New York

Cicatricial Ectropion, including Punctal Considerations

ALSTON CALLAHAN, M.D.
Birmingham, Alabama

Mechanical, including Paralytic Ectropion

CROWELL BEARD, M.D.
San Jose, Calif.

COMMITTEE ON RECONSTRUCTIVE PLASTIC SURGERY: OTOLARYNGOLOGY

State Ballroom

Tuesday, 8:00 p.m.

JOHN MARQUIS CONVERSE, M.D.
Chairman

The Immune Response to Tissue Transplants

FRANKLIN C. McLEAN, M.D.
Chicago

The Problem of the Unilateral Cleft Lip Nose; A Composite Operation for Revision of the Secondary Deformity

RICHARD T. FARRIOR, M.D.
Tampa, Fla.

Roentgen Diagnosis of Blow-out Fracture of the Orbit

JUDAH ZIZMOR, M.D.
New York
BY INVITATION

BYRON SMITH, M.D.
New York

CARL FASANO, M.D.
Jamaica, N. Y.
BY INVITATION

JOHN MARQUIS CONVERSE, M.D.
New York

SCIENTIFIC EXHIBITS

KENNETH L. ROPER, M.D., *Chairman*
EUGENE L. DERLACKI, M.D., *Co-Chairman*
CHICAGO, ILLINOIS

CLUB FLOOR

EXHIBIT S-1

The Problem of Correcting the Severely Deformed Nose

The exhibit consists of several oversized models depicting initially the severely deformed external nose and its coexisting deviated septum. The subsequent models illustrate step by step the surgical approach to this combined problem. Attention is first focused on the septum, doing what can be done without attacking the external nose, and finally mobilizing the external nose for the ultimate and proper positioning of the septum.

JOHN ALEXANDER GILL, M.D.
Medical College of Virginia
Richmond, Virginia

EXHIBIT S-1A

Present Concepts of Surgery for Chronic Ear Disease

Surgery for chronic ear disease of necessity may become radical, but the initial approach should be conservative. Many problems can be adequately managed without sacrifice of anatomical or functional structures. Perhaps the most important recent advance is avoidance of a postoperative mastoid cavity. All efforts should be made to maintain the normal anatomy of the ear canal. If extensive disease requires creation of a mastoid cavity, this cavity should be obliterated and the ear canal restored. At present, vein grafts appear to be giving the best results in grafting and repairing the tympanic membrane.

EDWARD C. BRANDOW, JR., M.D.
Albany Medical College and
Albany Medical Center Hospital
Albany, New York

EXHIBIT S-2

Otolaryngological Surgery of the Head and Neck

The exhibit consists of a series of ten self-contained panels, each six feet in length. The panels are comprised of a series of large transparencies depicting a number of interesting surgical lesions of the head and neck. A number of the panels demonstrate steps in the surgical correction of those lesions in which the technique is out of the ordinary. Some of the diseases included are laryngocele, thyroglossal cysts, midline dermoid of the nose, nasopharyngeal fibromas, tracheotomy and the secondary repair of depressed tracheotomy scars, and branchogenic cysts. Certain rare masses are demonstrated (venectasia, myxoma, pharyngocele, carotid body tumors, and neurilemmoma).

JOEL J. PRESSMAN, M.D.
MILDRED BURTZ SIMON, R. N., B. P. A.
School of Medicine
University of California at Los Angeles
Los Angeles

EXHIBIT S-3

The Seeing Eye

Exhibit consists of a seven-panel standing screen, 62 inches high and 124 inches in length; ten letter-size posters for affixing to back drop; and assorted literature to be displayed on table.

THE SEEING EYE, INC.
Morristown, New Jersey

EXHIBIT S-4

Community Resources for Blind Persons

Current information on community resources within each of the fifty states will be available for distribution to ophthalmologists. Professional consultants, including an ophthalmologist, and professional literature will be at the booth at all times.

AMERICAN FOUNDATION FOR THE BLIND, INC.
New York, N. Y.

Represented by Miss Kathern F. Gruber, and Miss Pauline M. Moor, New York, and Richard E. Hoover, M.D., Baltimore.

EXHIBIT S-5

Grant and Award Programs

The exhibit, providing information on research and training grants and awards available to individuals and institutions through the National Institute of Neurological Diseases and Blindness, features the purpose, availability, and primary data on qualifications of individuals and institutions, type and duration of support, amount of stipends and allowances, specialties of vital interest to the Institute, and instructions for application or renewal to qualified basic and clinical scientists for research or advanced study and training for academic careers in the neurological and sensory fields, in the United States and abroad.

THE NATIONAL INSTITUTE OF NEUROLOGICAL DISEASES AND BLINDNESS
Bethesda, Maryland

EXHIBIT S-6

Textbooks for the Visually Handicapped

The exhibit is devoted to demonstration of textbooks printed in large type and reading materials which have been transcribed into 18-point type from books with normal print used in the public schools. The work is done by volunteers of AID TO VISUALLY HANDICAPPED, INC., and distributed to all schools, private and parochial; hospitals, public libraries and individuals for the express purpose of aiding partially seeing children and adults who are unable to read books with smaller print.

NATIONAL AID TO VISUALLY HANDICAPPED
San Francisco

Represented by Mr. and Mrs. Gene Marchi, San Francisco.

EXHIBIT S-7

The Schiotz Tonometer: What You Should Know About It

This exhibit will demonstrate the various parts of the Schiotz tonometer which may not be functioning properly and thereby give a false reading. Charts, drawings and models of used tonometers will be shown to demonstrate how far off standards your tonometer can be. The exhibit will be attended daily to answer questions on the care and use of the instrument. A demonstration will be given showing the effect of friction on tonometer readings.

THE DEPARTMENT OF OPHTHALMOLOGY, NEW YORK UNIVERSITY SCHOOL OF MEDICINE
New York

Represented by Conrad Berens, M.D., New York; Mr. T. O. Gulden, Elkins Park, Pennsylvania, and Patricia Rainier, Jersey City, New Jersey.

EXHIBIT S-8

Speech and Hearing Rehabilitation: New Publications for Parents and Professionals

The exhibit features new publications on stuttering, aphasia and cleft palate for professionals and parents.

NATIONAL SOCIETY FOR CRIPPLED CHILDREN AND ADULTS
Chicago

Represented by Dean W. Roberts, M.D., Executive Director; and Mrs. Jayne Shover, Associate Director, Chicago.

EXHIBIT S-9

Exophoria-Tropia Home Training: Therapy and Procedure

Exhibit will give steps in successfully

treating divergent deviations with orthoptics. Surgical procedures have not been used on the cases in this study for the past seven years. Includes useful home training to prevent recurrence.

AMERICAN ASSOCIATION OF ORTHOPTIC TECHNICIANS
Bloomington, Illinois

Represented by Anita J. Stelzer, St. Louis; Mary E. Kramer, Phoenix, Arizona, and Doris J. Hachtel, Clayton, Missouri.

EXHIBIT S-10

Roentgen Study of the Larynx by Contrast Laryngography

A description of the technique of studying the larynx radiographically by coating the mucosal surface with contrast material. A presentation of the normal and abnormal roentgenographic appearance and physiology of the larynx demonstrated by this technique. Various pathologic conditions, including benign and malignant tumors of the supraglottic, glottic and subglottic regions and laryngeal palsy. A presentation of this method as a useful adjunct to endoscopy in the determination of extent of disease and proper therapeutic management.

PILAR CARBAJAL, M.D.; DANIEL C. BAKER, M.D.; WILLIAM B. SEAMAN, M.D.; JOSE MEDINA, M.D.; IRA KANTER, M.D.
Columbia-Presbyterian Medical Center
Departments of Otolaryngology and Radiology
New York.

EXHIBIT S-11

Oral Lesions

The exhibit includes 78 color (Kodachrome) transparencies enlarged to 5 by 7 inches. These pictures demonstrate common and uncommon oral lesions.

CHARLES S. GIFFIN, M.D.
WILLIAM H. SAUNDERS, M.D.
The Ohio State University Medical School
Department of Otolaryngology
Columbus, Ohio.

EXHIBIT S-12

Neurohistology of the Larynx

This exhibit demonstrates the peripheral innervation of the human larynx in the light of recent investigations. Photomicrographs depict the diverse sensory structures of the mucous membrane at different locations in the vocal cord and arytenoid area, as well as the different motor and sensory end organs in the thyroarytenoid muscle. The gradual development of these structures in the fetal and neonatal period is indicated. An enlarged reconstruction affords a three-dimensional view of the characteristic network in the mucous membrane, which is not apparent on single section. An illumi-model reveals our new concept of peripheral innervation of the human larynx.

HANS VON LEDEN, M.D.
Los Angeles
WERNER F. KONIG, M.D.
Heidelberg, Germany
PAUL MOORE, Ph.D.
Chicago
Northwestern University Medical School
Chicago
and
Ruprecht-Karl Universitat
Heidelberg, West Germany

EXHIBIT S-13

Pathology of Eye and Adnexa Due to Corneal Contact Lenses

This exhibit consists of photographs in color transparencies showing bacteriology and the gross and microscopic changes in the eye and adnexa due to corneal contact lenses. The source of this material is clinical cases and experimental animals. The photographs show bacterial infections, vascularization of the cornea, corneal epithelial craters, corneal abrasions, corneal anesthesia, limbal groove, papillary hypertrophy of the conjunctiva, sebaceous secretion, and mechanism of glare.

JOSEPH M. DIXON, M.D.
ELMAR LAWACZECK, M.D.
CHARLES H. WINKLER, Ph.D.
Medical College of Alabama
Birmingham, Alabama

EXHIBIT S-14

The Management of Cancer of the Lip

The emphasis of this presentation is on surgical techniques available in handling early and advanced lesions of the lip. Color slides and drawings are used. Biopsy with a 2-mm. punch biopsy is illustrated. Bone and soft tissue necrosis following irritation of this lesion is considered.

ROBERT C. KRATZ, M.D.
Newport, Kentucky

HERSHEL L. KAUFMAN, M.D.
University of Cincinnati Medical School
Cincinnati

EXHIBIT S-15

The Use of Radioactive Phosphorus in the Diagnosis of Ocular Tumors

The differential uptake of P^{32} by ocular tumors is utilized to differentiate benign from malignant lesions. The exhibit presents indications, rationale, procedure and instrumentation for the P^{32} test. Visual aids, including photomicrographs, plastic model and tabular data, are used to demonstrate the external and transconjunctival approaches for anterior and posterior lesions. Literature detailing the above will be available at the exhibit.

BERNARD GOLDBERG, M.D.

GERALD B. KARA, M.D.

DAVID TABOWITZ
New York Eye and Ear Infirmary
New York

EXHIBIT S-16

Lattice Degeneration of the Retina

Lattice degeneration is a frequent precursor of retinal detachment. This form of peripheral retinal disease, characterized by circumferential areas of retinal thinning with interlacing linear markings, is often associated with multiple small round holes. Pigment disturbance accompanies lattice degeneration and the retinal thinning predisposes to retinal tears. These retinal breaks are major factors in the development of retinal detachment.

This exhibit illustrates the clinical features of lattice degeneration and utilizes gross and microscopic material to correlate macroscopic appearance with histopathology. Various forms and degrees of lattice degeneration are portrayed and consideration is given to other common forms of peripheral retinal degeneration.

RAYMOND A. ALLEN, M.D.

BRADLEY R. STRAATSMA, M.D.
University of California Medical Center
Los Angeles

EXHIBIT S-17

Histopathology of Experimental Photocoagulations in the Dog Eye

Mild, moderate, and severe photocoagulation lesions were produced in the dog retina by means of the Meyer-Schwickerath Zeiss photocoagulator. The histopathology of these lesions as they appeared one hour, one day, one week, one month, four months, and eight months after photocoagulation is presented by means of color transparencies. Of special interest was the production of experimental exudative and hemorrhagic retinal detachments, vascular occlusions, choroidal hemorrhages, and other curious lesions. Special stains were employed to study the effect of photocoagulation on the vitreous overlying the lesions.

EDWARD OKUN, M.D.

ELEANOR M. COLLINS
Ophthalmology Branch, National Institute of Neurological Diseases and Blindness, National Institutes of Health, Bethesda, Maryland

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EXHIBIT S-18

Infrared Electronics in Ophthalmology

The exhibit illustrates the differences in perception possible under normal light conditions as opposed to infrared. The center panel of the exhibit contains an infrared sniperscope model with technamation, while the panels on either side contain a series of photographs of afflicted eyes. The photographs illustrate how the infrared

sniperscope can be used to reveal anatomical and functional changes in cases of corneal opacification which cannot be discerned under normal light conditions.

OFFICE OF NAVAL RESEARCH, DEPARTMENT OF THE NAVY
Washington, D. C.

EXHIBIT S-19

Photoanalysis of the Eye

Two distinct techniques and the instrumentation required for obtaining 35 mm. retinal stereophotographs will be shown. Apparatus and technique for obtaining ultra-close-up stereograms of the external eye will also be included. Several common and unusual stereopathologic views will be demonstrated.

Application of the mural-size, one meter in diameter, color transparency to depict pathologic changes of the ocular fundus will be introduced to the specialty. This technical photographic advance dramatically presents important clinical pathologic changes of the internal eye.

Photokeratoscopy and its relationship to the diagnosis and prognosis of corneal afflictions. The use of the photokeratogrammetric method in attempting to determine at outset the best corneal contact lens for a particular cornea, and how it compares to ophthalmometric measurements in determining the radius of curvature of the prime corneal meridians.

HERMAN J. NORTON, M.D.

CHARLES T. SULLIVAN, M.D.
University of Rochester Medical Center
Rochester, New York

EXHIBIT S-20

Ear Surgery, 1961

The purpose of this exhibit is to demonstrate the magnitude of otologic surgery from the superficial surgery of the stapes to the intracranial complications of mastoiditis. With a series of stereoscopic slides and accompanying description, the exhibit demonstrates the techniques for the removal and for the preservation of the stapedial footplate, the vein graft in tympanoplasty, the atticotomy, the endaural musculoplasty, and the complications of mastoid surgery.

J. BROWN FARRIOR, M.D.
Tampa General Hospital
Tampa, Florida

EXHIBIT S-21

The Ciliary Basement Membrane: Iridopathy and Retinopathy in the Human Diabetic Eye

The following findings in human diabetics will be demonstrated by color photomicrographs, electromicrographs and figures: (1) Remarkable thickening of the basement membrane of the ciliary process. (2) Saliva sensitive material in the vacuoles of the pigment epithelium. (3) Patent and hyalinized capillary aneurysms of the retina in flat preparations and cross sections. (4) Thickening of the retinal capillary and venule walls adjacent to aneurysms.

TSUYOSHI YAMASHITA, M.D.
Kingston, Ontario

BERNARD BECKER, M.D.
Department of Ophthalmology
School of Medicine
Washington University
St. Louis

EXHIBIT S-22

Clinical Evaluation of Acetazolamide Sustained Release Capsule in the Glaucoma Patient

Acetazolamide (Diamox) sustained re-

lease capsules have been employed for twenty-four months in all forms of difficult-to-control glaucoma. Long-term studies comparing efficacy, side-effects and dosage are made on patients who have, as well as those who have never, employed a carbonic anhydrase inhibitor before. Graphs depict average duration and maximum effects of single oral doses of all the available carbonic anhydrase inhibitors.

LAWRENCE L. GARNER, M.D.
E. FRANKLIN CARL, M.D.
JAMES FERWERDA, M.D.
Marquette University School of Medicine
Milwaukee County General Hospital
Milwaukee

EXHIBIT S-23

1. Temporal Bone Banks for Research
2. Audiometric Technique: Masking

The exhibit will cover two subjects by means of charts and posters. Number 1 is a description of the function of the Temporal Bone Banks and methods of collection of temporal bones. Number 2 will be information on the use of masking in audiometry.

COMMITTEE ON CONSERVATION OF HEARING
AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

EXHIBIT S-24

The Inflamed Eye

This exhibit shows the diagnosis and management of conditions commonly occurring in the eye, designed for the non-ophthalmologist. A three-dimensional model of the eye depicts eye grounds.

DAN M. GORDON, M.D.
New York Hospital, Cornell University Medical College
New York

EXHIBIT S-25

Ocular Tuberculosis

Various types of ocular tuberculosis are presented in color transparencies. Probable etiology and treatment are discussed on transparent panels.

JOHN E. EDWARDS, LT. COLONEL, MC, USA
Fitzsimons General Hospital, U. S. Army
Denver

EXHIBIT S-26

Biology 091: The Human Eye — A Home-Study College Course Written for the Layman

A graphic presentation of Biology 091 through six retroilluminated transparencies with transparency captions, white block-letter titles and descriptions, and blown-up photographs. Table display showing course materials in Braille, talking textbooks, and inkprint. Descriptive literature on the course and on the total program of the Hadley School for the Blind, the world's only home-study school for blind students, offering all services free of charge. Course interests doctors as training for lay staff and for patients interested in study of the eye.

THE HADLEY SCHOOL FOR THE BLIND
Winnetka, Illinois

OFFICIAL REPRESENTATIVES

Representatives of the following organizations will maintain information desks in Private Dining Room 14 on the Club Floor for the convenience of Academy members and guests:

AMERICAN BOARD OF OPHTHALMOLOGY

AMERICAN BOARD OF OPTICIANRY

NATIONAL SOCIETY FOR THE PREVENTION OF BLINDNESS

ARCHIVES OF OTOLARYNGOLOGY

TECHNICAL EXHIBITORS — 1961

Exhibitor	Booth No.
Alcon Laboratories, Inc.	58 and 59
The Alkalol Company	29
Allergan Pharmaceuticals	R-32
Ambco, Inc.	R-24
American Bifocal Company, Inc.	419
American Cyanamid Company, Surgical Products Division	R-16
American Optical Co.	7 through 14, including 7a
The American Tobacco Company, Department of Research and Development	R-17 and R-18
Ar-Ex Products Co.	729
Armorlite Lens Company, Inc.	R-47
Artificial Human Eyes, Earle C. Schreiber, Inc.	R-27 and R-28
Astra Pharmaceutical Products, Inc.	428
Aurex Corporation	R-20
Barnes-Hind Ophthalmic Products, Inc.	R-49
Barnett Optical Laboratories	37
Bausch & Lomb, Inc.	95 through 102
Baxter Laboratories, Inc.	404
Rudolph Beaver	R-21
Austin Belgard Rx Opticians	18 and ½ of 19
Beltone Hearing Aid Company	R-9
Benson Optical Company	85, 86 and 87
Blakiston Division, McGraw-Hill Book Co., Inc.	62
Boll & Lewis Optical Company	43 and 44
Broemmel Pharmaceuticals	63
Burroughs Wellcome & Co. (U.S.A.), Inc.	120
Burton Medic-Quipment Company	747
Burton, Parsons & Company	411
Cameron Surgical Instruments Company	76
The Chloraseptic Company	402
ClerSite Company	"A"
The Coca-Cola Company	26
Codman & Shurtleff, Inc.	R-41 and R-42
Compass Travel Bureau, Inc.	421
Contact Lens Society of America	116
Continental Optical Company	R-15
Coreco Research Corporation	61
Crookes-Barnes Laboratories, Inc	R-43
Joseph K. Dennis Company, Inc.	51
The DeVilbiss Company	16
Lester A. Dine Company	121
Doho Chemical Corporation	34
Dome Chemicals, Inc.	415
Duke Laboratories, Inc.	414
Eckstein Bros.	412
Encyclopaedia Britannica	47
Engelhard Hanovia, Inc., National Electric Instrument Division	R-46 and ½ of R-45
Ethicon, Inc.	64
Grason-Stadler Company, Inc.	R-36
Grieshaber Swiss Eye Instruments	38
Grune & Stratton, Inc.	35
Guild of Prescription Opticians of America, Inc.	41 and 42
Harlequin Corporation	6
Haug Drug Co.	423
Paul B. Hoeber, Inc.	32
Hollister-Stier Laboratories, Inc.	46
The House of Vision, Inc.	65, 66, 67 and 68
Hudson Optical Corporation	109

Exhibitor	Booth No.
Industrial Acoustics Company, Inc.	R-37
Ion Optical Company	R-11 and R-12
Fritz Jardon Laboratories	R-6
Jenkel-Davidson Optical Company	105 and 107
Keeler Optical Products, Inc.	92 and 93A
Kelley & Hueber, Inc.	R-8
Keystone View Company	23 and 24
F. & F. Koenigkramer Company	R-44 and ½ of R-45
Kono Sales Company, Inc.	108
Koppers Company, Inc.	416
S. G. Krebs Company, Inc.	429
Lea & Febiger	53
Lederle Laboratories Division, American Cyanamid Company	R-5
Liberty Optical Manufacturing Company., Inc.	90A
J. B. Lippincott Company	49
Little, Brown & Company	R-10
P. Lorillard Company	403
Mager & Gougelman, Inc.	20 and ½ of 19
Maico Electronics, Inc.	69 and 70
Matalene Surgical Instruments Co., Inc.	81 and 82
McLeod Optical Co., Inc.	R-48
Medical Case History Bureau	115
Medical Contact Lens Service	745
Medical Film Guild, Ltd.	L-L
Merck Sharp & Dohme, Division of Merck & Company, Inc.	45
Miles Reproducer Co., Inc.	427
Miller Surgical Co.	89
Modern Optics, Division of Shuron Optical Company	72 and 73
The C. V. Mosby Company	88
V. Mueller & Company	1 through 5
Mueller Welt Contact Lenses, Inc.	R-39, R-40 and 760
New Era Optical Company	R-3 and R-4
Nikon Inc.	409
Obrig Laboratories, Inc.	110
Omega Instrument Co.	118
Ophthalmos, Inc.	R-13
The Opticase Company	15
Optometics, Inc.	418
Otarion Listener Corporation	405
Parsons Optical Laboratories	R-25 and R-26
George P. Pilling & Son Company	77, 78 and 79
Plastic Contact Lens Company,	R-1, R-2 and 787
Alfred P. Poll	119
Precision-Cosmet Company, Inc.	R-30 and R-31
W. F. Prior Company	413
Professional Pharmacal Company, Inc.	R-33
The Professional Press, Inc.	52
The Purdue Frederick Company	707
R. J. Reynolds Tobacco Company	27 and 28
The Rhinopto Company, Inc.	746
Richards Manufacturing Company	741 and 742
Ritter Company, Inc.	71
Roche Laboratories	401
Sandoz Pharmaceuticals	30
W. B. Saunders Company	R-35
Schering Corporation	33
Schieffelin & Company	50
Robert B. Scott	R-34
Shuron Optical Company	83 and 84
Smith-Dorsey Pharmaceuticals	741

Exhibitor	Booth No.
Smith, Kline & French Laboratories	R-29
Smith, Miller & Patch, Inc.	R-19 and 408
Sonotone Corporation	80
E. R. Squibb & Sons	R-38
Storck Pharmaceuticals, Inc.	25
Storz Instrument Company	111 through 114
Surgical Mechanical Research, Inc.	90B and 91
The Thermosector Company	31
Titmus Optical Co., Inc.	R-22 and R-23
Uhlemann Optical Company	54 through 57
Univis, Inc.	39, 40 and 407
Vicon Instrument Company	106
Victory Optical Mfg. Co.	103 and 104
Vision-Ease Corporation	60
Dr. Max M. von Stirne	R-7
Wagtowne Enterprise, Inc.	406
Walton Laboratories, Inc.	R-14
Wampole Laboratories	410
Welch-Allyn Inc.	17
White-Haines Optical Co.	21 and 22
The Williams & Wilkins Company	36
Winthrop Laboratories	117
Carl Zeiss, Inc.	74 and 75
Zenith Radio Corporation	93B and 94
Zylite Products Company, Inc.	48

TECHNICAL EXHIBITS

The Academy is appreciative of the cooperation of all technical exhibitors.

Booths with numbers preceded by "R" are located in the Red Lacquer Room.
Booths with three numerals beginning with 4 or 7 are on the Club Floor and Seventh Floor respectively.
All other booths are in the Exhibit Hall.

Alcon Laboratories, Inc., Fort Worth
Booths 58 and 59

New developments in ophthalmic and rhinologic medication resulting from continuous research exclusively in these fields may be discussed with personnel from Alcon's Research and Sales Departments. Alcon's full line of sterile ophthalmic preparations for prescriptions, office treatment and ocular surgery will be displayed, together with Alcon-efrin, a specially formulated nonstinging, nonirritating nasal decongestant in three strengths.

The Alkalol Company, Taunton, Mass.
Booth 29

The Alkalol Company is featuring Alkalol, a solution especially designed for the treatment of the mucous membranes of the nose and throat.

Its balanced formula of salts and essential oils makes a solution that is effective and at the same time nontoxic, mild and pleasant. It is alkaline and a mucous solvent.

Alkalol is an excellent vehicle for many drugs. For further information please call at Booth 29.

Allergan Pharmaceuticals, Los Angeles
Booth R-32

Allergan's growing family of sterile ophthalmic specialties will be presented for your consideration along with current projects of Allergan research in ophthalmic therapeutics.

BLEPHAMIDE Ophthalmic Liquifilm, the first specific for completely comprehensive treatment of seborrheic and staphylococcal blepharitis, offers a new, unique concept in ophthalmic dosage.

The PREDNEFRIN group of steroid preparations, so well known to ophthalmologists, is prominently featured.

For chronic simple glaucoma, Allergan representatives will discuss PILOFRIN, which avoids many complaints of irritation so common with miotics.

Also, OPHTHETIC, the new, rapid-acting, nonirritating ophthalmic anesthetic preparation and ALLERGAN WETTING SOLUTION for contact lenses are shown with supporting scientific data.

Ambco, Inc., Los Angeles
Booth R-24

Ambco, Inc., greets you from Booth R-24, where we are showing the latest developments in fully transistorized audiometers, including five new models, a complete line of audiometers for every use and for every price.

Our line of audiometers includes battery-operated instruments as well as AC powered units. Also on display, a completely new line of transistorized speech and auditory training equipment. New portable units as well as new fixed location instruments will be exhibited.

Competent personnel will be on hand to answer your questions and offer help.

American Bifocal Company, Inc., Cleveland
Booth 419

Manufactured under the exclusive GITSON PROCESS, the American Bifocal Company displays:

A B C Cataract Multifocal lenses: **Aspheric** Volk Catra Conoid Trifocals and Bifocals. A B C Straight Top Trifocals and Bifocals.

Lenses for Indirect Ohpthalmoscopy: Aspheric Glass Volk Conoid Condensing Lenses.

Subnormal Vision:
Glass, Aspheric, Volk Conoid Trial Sets and Volk Conoid Rx Lenses.

A B C Spherical Straight Top Trifocals and Bifocals for general prescriptions.

The new A B C THINLINE STRAIGHT TOP BIFOCAL:
Another new lens under the GITSON PROCESS. Newly designed to minimize the segment line, with easier adjustment for the new presbyope.

American Cyanamid Company, Surgical Products Division, Danbury, Conn.
Booth R-16

AMERICAN CYANAMID COMPANY SURGICAL PRODUCTS DIVISION, 1 Casper Street, Danbury, Conn., manufacturers of DAVIS & GECK SUTURES in the new Surgilope SP Sterile Strip Pack with Atraumatic Needles; VIM HYPODERMIC NEEDLES and SYRINGES. Other specialties include SURGAIRE — sterile deodorant spray ointment, TOPASIL — silicone skin protectant, CURON — elastic foam bandage, DISPOSABLE NEEDLES AND SYRINGES, and Blood Lancets.

American Optical Company, Southbridge, Mass.
Booths 7 through 14 including 7a

American Optical Company's exhibit at the Sixty-sixth Annual Meeting of the American Academy of Ophthalmology and Otolaryngology will include its Consul Fitting Room Furniture line, featuring the new Consul 44 fitting table; the Adapta-Rod Space Maker; and the five-purpose Consulette.

In lenses, Tillyer AOLITE Uniform Density lenses will be shown with Aspheric Cataract, Executive and Sovereign lenses. Also on display will be the 1961 Outdoor Eyewear line and a number of new cases.

Diagnostic instruments will include the Vistamatic Giantscope and Radiuscope. On display will be AO's new surgical microscope, and of special note, the new lensometer in three American Beauty colors and the Therm-O-Jet frame warmer.

The American Tobacco Company, Department of Research and Development, Richmond, Va.
Booths R-17 and R-18

This exhibit features a full-color presentation of tobacco culture and newer aspects of tobacco research, including the use of activated charcoal as a filter medium for cigarette smoke. The effectiveness of activated charcoal in significantly reducing the components of the vapor phase of the smoke is graphically presented.

Technical literature, including a newly revised and enlarged edition of "A Summary of Biologic Research on Tobacco Supported by The American Tobacco Company," will be available for distribution.

Attending representatives will welcome questions concerning research and control in the tobacco industry.

Ar-Ex Products Company, Chicago
Booth 729

AR-EX Products will display their complete line of Hypo-allergenic Cosmetics including eye make-up products. Hypo-allergenic Mascara, Eye Pencil and Eye Shadow is now of major importance to all women allergic to conventional eye make-up. AR-EX will also introduce their new Moisture Lotion. AR-EX representatives competent to give you complete information regarding both new and established AR-EX Products will be happy to welcome you at their booth.

Armorlite Lens Company, Inc., Pasadena, Calif. **Booth R-47**

The Armorlite Lens Company, original developers of durable hard plastic lenses, will demonstrate the wide range in which light-weight, safe lenses are now available.

These will include examples of the safest of all lenses for children, athletes, and industrial workers; feather-weight bifocals for aphakics; and ultraviolet absorbing hard resin lenses. Added to the regular lines will be Armorlite's new aspheric lenticular lenses for post-cataract patients, offering the patient a much wider and more natural field than ordinary lenses. Armorlites are available in all popular tints and are uniform in density.

Artificial Human Eyes, Newark, N. J.
Booths R-27 and R-28

Joint exhibitors in this booth are E. & S. Danz, New York; G. Danz & Sons, San Francisco; Richard Danz & Sons, New York; Erickson Laboratories, Seattle; Erickson Laboratories, Spokane; Greiner & Mueller, Chicago; L & B Laboratories, Inc., Fort Lauderdale; Hugo Leipold, Pittsburgh, and Earle C. Schreiber, Inc., Newark, N. J.

This exhibit of Artificial Human Eyes will include color photos of unusual cases, and a list of the services that are available to the patient and ophthalmologist. An implant and conformer for every type of preferenc will also be found here. We will feature a series of colored slides depicting the treatment of some of our "problem cases."

Astra Pharmaceutical Products, Inc., Worcester, Mass. Booth 428

Descriptive literature pertaining to preparations of XYLOCAINE® HYDROCHLORIDE (ASTRA) for all local anesthetic procedures ranging from infiltration to regional block, including peridural, spinal, and topical anesthesia, XYLOCAINE OINTMENT, XYLOCAINE JELLY, and XYLOCAINE VISCOUS for topical application, as well as ASTRAFER® I. V. for iron deficiency states will be available at the ASTRA booth presided over by Mr. Edward W. Friedel.

Aurex Corporation, Chicago
Booth R-20

Ayerst Laboratories, New York Booth 420

Barnes-Hind Ophthalmic Products, Inc., Sunnyvale, Calif. Booth R-49

Barnes-Hind Ophthalmic Products, Inc., will introduce a revolutionary epinephrine, U.S.P., eye drop for the control of open angle glaucoma, marketed under the trademark "Eppy."

The new epinephrine complex is buffered to the pH of 7.4, exhibits maximum physiologic activity, and maintains previously unheard of chemical stability for this drug. Shelf life "unopened" is in excess of one year and refrigeration is not required, even after "opened" for use.

Barnes-Hind will also exhibit "Minims," a new concept for the delivery of sterile ophthalmic drops in sterile disposable units. Ideal for surgery and first aid rooms, as well as the ophthalmologist's office. Minims offer complete assurance to the physician that the ophthalmic solutions he requires are sterile and of stated potency.

In addition to "Minims" and "Eppy," the most complete and compatible line of contact lens solutions available to the contact lens wearer will be demonstrated.

We invite you to visit Booth R-49 to see and discuss these products.

Barnett Optical Laboratories, Chicago
Booth 37

Bausch & Lomb, Inc., Rochester, N. Y.
Booths 95 through 102

Modern ophthalmic instrumentation will be the core of the Bausch & Lomb technical exhibit.

Precision instruments with engineered convenience for professional men will be featured. These include the Deluxe Refracting Unit in Biscayne Blue, Green's Refractor and the Thorpe Slit Lamp with Applanation Tonometer.

B & L's complete line of hand diagnostic instruments designed for quick, comfortable handling and scientific accuracy will also be displayed.

A staff of instrument experts will demonstrate and explain the instrument operation and purpose, and answer any questions.

The latest B & L Ophthalmic Frames and Lenses will also be on display.

Baxter Laboratories, Inc., Morton Grove, Ill. Booth 404

Rudolph Beaver, Waltham, Mass.
Booth R-21

Austin Belgard RX Opticians, Chicago
Booths 18 and ½ of 19

Beltone Hearing Aid Company, Chicago
Booth R-9

Benson Optical Company, Minneapolis
Booths 85, 86 and 87

Benson Optical Company again this year will display a complete line of instruments and equipment together with the custom-built electric control center for all instruments and lights in the examining room. The latest in Hearing Aids and portable screening audiometer will be displayed. These things, together with office furniture, our planning service, contact lenses and complicated prescriptions will make Benson's booth a worthwhile visit.

Blakiston Division, McGraw-Hill Book Co., Inc., New York **Booth 62**

The Blakiston Division of the McGraw-Hill Book Company invites all attendees at the convention to visit their exhibit at Booth 62, which will feature the following publications of special interest to ophthalmologists and otolaryngologists: Paton, Katzin, and Stilwell's ATLAS OF EYE SURGERY. This outstanding work presents a visual approach to eye surgery using 464 line drawings to show step-by-step procedures for operating techniques; Paton's KERATOPLASTY. A thorough and exactly illustrated book presenting modern techniques and data in the whole field of keratoplasty; and Kassay's CLINICAL APPLICATIONS OF BRONCHOLOGY. This unique guide for all physicians interested in bronchology is a first in medical publishing. It is an up-to-date book on bronchology and the diagnosis of pulmonary diseases.

Boll & Lewis Optical Company, Chicago
Booths 43 and 44

The Boll & Lewis Optical Company exhibit will feature the latest developments in visual aids for patients with subnormal vision; cataract lens loaner service; contact lenses; Armorlite Plastic Lenses; domestic and foreign ophthalmic and diagnostic equipment; the latest styles in ophthalmic frames; and a new answer to comfortable ptosis frames.

Broemmel Pharmaceuticals, San Francisco
Booth 63

Burroughs Wellcome & Co. (USA), Inc., Tuckahoe, N. Y. **Booth 120**

You are cordially invited to visit with our staff and a member of our Medical Department to discuss our newest products pertaining to ophthalmology and otolaryngology.

New Products will include 'Actifed', a potent antihistaminic and decongestant that has been found effective in a significant percentage of cases of allergic rhinitis in patients failing to respond to antihistaminics alone. The latest developments in our 'Cortisporin' and 'Neosporin' products will also be available for your inspection.

Burton Medic-Quipment Company, El Segundo, Calif. **Booth 747**

Burton, Parsons & Company, Washington, D. C. **Booth 411**

Cameron Surgical Instruments Company, Chicago **Booth 76**

The Cameron exhibit is always extremely interesting. This year the first electrified biopsy forceps will be shown.

The Cameron-Lempert safety headlite this year received the approval of the U. S. Government and the City of New York for use in hazardous areas. It is still the world's greatest headlite.

The Cameron electrosurgical units are leading their field by a large margin, and more and more doctors are showing their preference for Cameron's as fast as they learn the difference between "hot" and "cold" coagulation. The Cameron electrosurgical unit for E. N. T. work has only "cold" coagulation.

See them all now at Booth 76.

The Chloraseptic Company, Washington, D. C. Booth 402

Chloraseptic is a nontoxic, pleasant-tasting mouthwash and gargle specifically designed to destroy infectious bacteria while relieving soreness and pain of the oral and pharyngeal tissues. It possesses profound bactericidal and fungicidal properties, and is an effective topical anesthetic. Chloraseptic is indicated in the treatment of pharyngitis, tonsillitis, post-tonsillectomy soreness, smoker's throat, aphthous ulcers, infectious stomatitis, moniliasis (thrush) and Vincent's infection.

ClerSite Company, Chicago Booth A

The Coca-Cola Company, Atlanta, Ga. Booth 26

Ice-cold Coca-Cola served through the courtesy and cooperation of the Coca-Cola Bottling Company of Chicago, Inc., and The Coca-Cola Company.

Codman & Shurtleff, Inc., Boston Booths R-41 and R-42

At Booths R-41 and R-42, Codman & Shurtleff, Inc., makers of surgical instruments since 1838, will show a complete line of eye, ear, nose and throat instruments.

Many new instruments in these specialties will be shown for the first time.

Be sure to leave your name and address to receive our new eye, ear, nose and throat catalogue, which is now available.

Compass Travel Bureau, Inc., New York Booth 421

Contact Lens Society of America, Philadelphia Booth 116

Continental Optical Company, Indianapolis Booth R-15

Continental Optical Company will introduce a new frame line in its newly designed Booth R-15 in the Red Lacquer Room. The new line, a specially reinforced zyl frame for little boys, will be featured as the companion frame to Continental's Fairy Dust, a current release for little girls. In addition, Continental will show other current lenses and frames in its wide selection of ophthalmic products. Company executives will be on hand during all exhibit hours.

Coreco Research Corporation, New York Booth 61

The Coret Camera embodies the principle of electronic flash and constant automatic control of such factors as distance, aperture, field, and exposure. Coreco offers a completely automatic professional clinical camera purposely designed to achieve the ultimate in surface, intra-oral, and intratubular photography. Because of the simplicity of operation, even an inexperienced doctor or nurse can achieve consistently perfect color transparencies.

Crookes-Barnes Laboratories, Inc., Wayne, N. J. Booth R-43

Crookes-Barnes invites you to discuss the Iso-Sol ophthalmic products of interest with our sales personnel. Iso-Sol offers the most complete line of sterile buffered ophthalmic solutions available for your use. New and seasonal products of interest include Sulfacidin and Sulfa-Statin (antibiotic and chemotherapeutic products of note), Optihist (an antihistaminic decongestant), Tearisol and Tear-Efrin (artificial tears plain and with phenylephrine).

Greatest flexibility for Pilocarpine therapy is offered with a choice of three vehicles and dosage strengths from 0.5 to 6.0 per cent.

Joseph K. Dennis Company, Inc., Chicago Booth 51

The Joseph K. Dennis Company, Inc., AAOO Group Insurance Administrators have available a trained staff of Insurance Counsellors to assist Academy Members with their Group Insurance Programs. Plan to stop at Booth 51 and receive your up-to-date Group Insurance Portfolio.

The DeVilbiss Company, Somerset, Pa.
Booth 16

The DeVilbiss Company cordially invites the members of the Academy to visit its exhibit of atomizers, nebulizers, steam vaporizers, and related aerosol therapy equipment. Representatives of DeVilbiss will be pleased to demonstrate and answer any questions regarding the No. 144 Plastic Vaporizer and the new No. 42 Plastic Pocket Nebulizer, as well as the complete prescription and professional lines of atomizers, nebulizers and vaporizers.

Lester A. Dine Company, Woodside, N. Y.
Booth 121

Featuring the ideal photographic setup for close-up color slides. (Using your camera or ours.) In addition, the new sensational Black Light Accessory for our Eye Camera will be exhibited. Also we will be showing equipment for taking other than eye pictures with the KODAK STARTECH or the Electronic Ring light. See our camera for taking Fundus pictures. Our Booth is always one of the highlights of the meeting.

Doho Chemical Corporation, New York
Booth 34

AURALGAN—Ear medication for relief of pain in Otitis Media; also removal of Cerumen.

RHINALGAN—Nasal decongestant free from systemic or circulatory effect. Safe for infants—aged.

OTOSMOSAN—Nontoxic fungicide-bactericide (gram negative — gram positive) for suppurative and aural dermatomycotic ears.

LARYLGAN—Soothing throat spray and gargle for infectious and noninfectious sore throat involvements.

BIOTOSMOSAN HC—The solution to the "Problem Ear." Antimicrobial, Anti-inflammatory, De-inflammatory, Anti-allergic, Antipruritic (contains Hydrocortisone).

Dome Chemicals, Inc., New York
Booth 415

Dome Chemicals will exhibit aural products for treatment of various types of acute, subacute and chronic otitis externa, such as seborrheic dermatitis, eczema, diffuse otitis externa, and for treatment of infections and inflammatory conditions of the external ear canal. Ocular products will be exhibited for anti-inflammatory and antiallergic treatment of the anterior segment of the eye uncomplicated by infection; for several forms of blepharitis and conjunctivitis; mild acute iritis; recurrent marginal ulceration and control of secondary glaucoma from anterior uveal inflammation.

Duke Laboratories, Inc., South Norwalk, Conn. **Booth 414**

Eckstein Bros., Los Angeles **Booth 412**

Manufacturers of compact, portable, battery-powered auditory equipment. This includes all-transistor audiometers, binaural auditory trainers, and master hearing aids. These instruments are characterized by their accuracy and high quality and have been engineered to provide extreme reliability with lightweight packaging and miniaturized size.

Portable Audiometers — all transistor, weight five pounds

Model 200: Basic threshold audiometer with double headset

Model 200MB: Diagnostic audiometer including bone conduction and calibrated white noise masking

Auditory Trainers—all transistor, weight approximately one pound

Model 31: Binaural desk type hearing amplifier

Model 33: Master binaural desk type hearing amplifier with separate variable tone, gain and output controls

Master Hearing Aid — all transistor, weight 1.5 pounds

Model 35: Binaural hearing aid evaluation instrument

Encyclopaedia Britannica, Chicago
Booth 47

A great new edition of the Encyclopaedia Britannica and its correlated fact-finding and research services will be on display at this meeting.

To those who may be interested in acquiring Britannica, there is available a special exhibit discount.

Whether your interest is current or for the future, please visit our booth.

You need not invest to investigate.

Engelhard Hanovia, Inc., National Electric Instrument Division, Newark, N. J.
Booths ½ of R-45, and R-46

Ethicon, Inc., Somerville, N. J.
Booth 64

Electron Sterilized Surgical Gut... stronger, more pliable, easier to handle, and new easy-open foil suture packages are featured. Exclusive Collagen Pure, Tru-Chromicized, Tru-Gauged properties of ETHICON surgical gut will be demonstrated, as well as a complete line of ATRALOC Needle Sutures for every surgical need. Tru-Permanized Surgical Silk and Surgical Cotton, along with other surgical specialties, will also be shown.

Grason-Stadler Company, Inc., West Concord, Mass. **Booth R-36**

Grason-Stadler Company, Inc., cordially invite you to visit their exhibit where equipment of interest to Academy members will be displayed. Included in the exhibit will be a speech audiometer listed by the Subcommittee on Listing of Audiometers of the American Academy of Ophthalmology and Otolaryngology. A Bekesy Audiometer with unique features which facilitate administration of special tests useful in diagnosis of hearing difficulties will be displayed. Representatives of the company will be glad to discuss problems of application and operation.

Grieshaber Swiss Eye Instruments, Chicago
Booth 38

It is our pleasure to welcome members of the American Academy of Ophthalmology and Otolaryngology to visit our display of Genuine Grieshaber Swiss Eye Instruments.

The original patterns of Greishaber instruments have maintained an exclusive reputation for excellence through the years. They are a pleasure to use and they enhance the Ophthalmic surgeon's skilled techniques.

This is your annual opportunity to inspect these fine instruments and we urge our regular customers to place their orders promptly for earliest possible delivery.

Grune & Stratton, Inc., New York
Booth 35

Our Mr. Kurzer will be on hand to show our new volumes. Included will be such books as Criep's CLINICAL IMMUNOLOGY AND ALLERGY, Huzly's AN ATLAS OF BRONCHOSCOPY, Kestenbaum's METHODS OF NEURO-OPHTHALMOLOGIC EXAMINATION (Second Revised and Enlarged Edition), Kestenbaum's APPLIED ANATOMY OF THE EYE, Myklebust's PSYCHOLOGY OF DEAFNESS, and Szanto's PATHOLOGY OF THE EAR, NOSE AND THROAT. The latest foreign books in Ophthalmology and Otolaryngology will also be on display.

Guild of Prescription Opticians of America, Inc., New York **Booths 41 and 42**

Adjustment of glasses and minor repairs will be continuously available for the convenience of Academy members and guests who may need this service. Guild materials in support of medical eye care will be on display.

Harlequin Corporation, New York
Booth 6

Educational material in respect to better vision through better styling, highlighting the Force of Fashion in the Doctor-Patient Relationship.

Haug Drug Co., Milwaukee Booth 423

Our exhibit will feature GLAUCON (Levoepinephrine 2%, as the HCL) Ophthalmic Solution for use in the medical management of open-angle glaucoma.

GLAUCON is the result of more than four years of clinical and pharmaceutical research to prepare a stable, sterile, non-irritating epinephrine solution. GLAUCON is effective alone in reducing intraocular pressure, but finds its greatest use when combined with miotics and/or carbonic anhydrase inhibitors in cases that respond poorly or not at all to other therapy.

Literature and reprints on recent clinical studies will be available.

Paul B. Hoeber, Inc., New York Booth 32

On hand will be copies of the new STAPES SURGERY FOR OTOSCLEROSIS by Victor Goodhill. You are also invited to inspect Sugar's THE GLAUCOMAS, 2nd Edition; Pack and Ariel's TREATMENT OF TUMORS OF THE HEAD AND NECK; Durham's ENCYCLOPEDIA OF MEDICAL SYNDROMES, and the classic work BIOMICROSCOPY OF THE EYE by Berliner.

Hollister-Stier Laboratories, Inc., Chicago Booth 46

Members of our technical service staff will be in attendance at the exhibit to discuss important special antigens and their application. Antigens of special interest to the members of the American Academy of Ophthalmology and Otolaryngology will be the mold, stinging insect antigens, bacterials, and of course pollen extracts, epidermals, and miscellaneous antigens that are so important in upper respiratory allergies.

The House of Vision, Inc., Chicago Booths 65 through 68

The House of Vision will introduce the new Visionette Lens Cabinet Ensemble, an illuminated lens cabinet designed to adjust to almost any office space. With it will be a new all-purpose transformer providing selective power up to twelve volts.

The famous Haag-Streit line will be displayed — and Zeiss, Gambs, Krahn, Rayner, Curry & Paxton, Heine, etc. — with all the domestic lines of fine ophthalmic equipment.

And see a complete selection of orthoptic and field equipment, including the Allied Photo Plotting Unit, Strabismometer, Ring Fusion Tester, and various instruments for gonioscopy — as well as safety materials and equipment.

Hudson Optical Corporation, Long Island City, N. Y. Booth 109

Industrial Acoustics Company, Inc., New York Booth R-37

Representatives of this pioneer New York medical-acoustical firm will be pleased to discuss all aspects of an adequate hearing testing program with you. Where audiograms are used as a basis for middle ear surgery, medical-legal adjudication and proper rehabilitative procedures, the attention of the Hearing Profession has been focused on the problem of obtaining valid and accurate audiograms from patients. The latest and improved version of the IAC line of Audiometric Examination Rooms as well as the new Rudmose Automatic Audiometer will be on display. An inexpensive audiometer calibration check instrument will also be shown and demonstrated.

We look forward to this annual visit with you.

Ion Optical Company, Detroit Booths R-11 and R-12

Fritz Jardon Laboratories, Detroit Booth R-6

The Fritz Jardon Plastic Research Corporation's display will include:

Custom artificial eyes and surgical implants

Introduction of newly developed prosthetic molding technique for eye control and positioning

Contact lens' display showing types of lenses, fitting procedures, and measuring equipment for various lenses

The booth will be staffed by technicians who will give a resume of fitting and demonstrate techniques of adjusting. Verbal and pictorial descriptions of types of lenses and their uses will be given to booth visitors.

Jenkel-Davidson Optical Company, San Francisco Booths 105 and 107

Jenkel-Davidson presents a new self-illuminating test object for your Tangent Screen or Perimeter. Sets a new standard of uniformity in field testing — test object is electroluminescent material whose surface brightness is equivalent to the surface brightness of a standard Berens Pin illuminated by 7 to 7.5 foot-candles of light.

Also, other Jenkel-Davidson designed equipment for the use and convenience of the ophthalmologist.

Keeler Optical Products, Inc., Philadelphia Booths 92 and 93A

The FISON BINOCULAR INDIRECT OPHTHALMOSCOPE provides brilliant illumination, fully stereoscopic vision; it is lightweight and comfortable. An accessory Reflector, enabling two doctors to view simultaneously, is also valuable for teaching.

The lightweight SPOTLIGHT ATTACHMENT for the Keeler Magnifying Spectacle gives intense shadow-free illumination.

A new De Luxe Combination Set comprises the "Practitioner" Ophthalmoscope plus the WIDE-ANGLE OTOSCOPE, featuring all-nylon specula, 3.5 or 6 power telescopic magnification, ample operating space, brilliant light and low cost.

The FOREIGN BODY LOCATOR is compact and portable. It discriminates between ferrous and nonferrous metals. Highly accurate detection and localization are unaffected by other metals nearby.

Kelley & Hueber, Inc., Philadelphia Booth R-8

We will be exhibiting our complete line of spectacle cases, optical frame displays and contact lens cases, contact lens soaking units and contact lens accessories.

We manufacture the widest variety of spectacle cases in the country today, and our booth will be attended by representatives who will be able to help our visitors with any particular problems that they might have.

Keystone View Company, Meadville, Pa. Booths 23 and 24

The Keystone View Company exhibit includes binocular functioning tests and orthoptic training materials. The Professional Orthoscope tests for diagnosing functional vision will be of special interest.

Orthoptic training equipment and materials for all types of cases are exhibited and will be demonstrated by competent technicians. A new testing unit for first, second, and third grade fusion, which requires no special equipment and which will enlist the eager cooperation of young patients, will be of special interest to doctors and orthoptists.

Various types of vision screening tests are available for inspection and demonstration.

F. & F. Koenigkramer Company, Cincinnati Booths R-44 & ½ of R-45

The RELIANCE booth will feature the new Number 600 Motor Hydraulic EENT Chair. Its function, appearance and cost have been extremely well received.

Its companion pieces, the famous RELIANCE spring compensated instrument stand, the adjustable instrument table, RELIANCE stools and conventional hydraulic chairs will also be demonstrated.

Representatives from various parts of the country will be at the booth to answer your questions.

Kono Sales Company, Inc., Charleston Hgts., S. C. Booth 108

We will introduce several new styles and colors in prescription eye wear. Also featured will be an exhibit of odd and interesting frames made for special cases.

Viewers who lean to the lighter side of life will be delighted with the array of gag frames which sports many newer and even daffier frames.

Koppers Company, Inc., Baltimore
Booth 416

S. G. Krebs Company, Inc., New York
Booth 429

A visit to our booth will convince you why even more Ophthalmologists and Otolaryngologists are using our equipment.

We will be featuring a complete line of the latest in eye surgical instruments, refracting equipment, diagnostic and visual training items, as well as a complete and varied line of specialties in the field of Ophthalmology.

Our ENT units as well as our mobilization and other ENT instruments will be of great interest to the Otolaryngologist.

Lea & Febiger, Philadelphia
Booth 53

Lea & Febiger invites you to examine the many books of interest to members of the American Academy of Ophthalmology and Otolaryngology. Be sure to see Cushman—STRABISMUS; Town—OPTHALMOLOGY; Spaeth — OPHTHALMIC SURGERY; Joslin — TREATMENT OF DIABETES MELLITUS; McNeal, Alpers and O'Brien—MANAGEMENT OF THE PATIENT WITH HEADACHE; Ballenger and Ballenger — DISEASES OF THE NOSE, THROAT AND EAR; Krimsky—BINOCULAR IMBALANCE; Ballenger and Ballenger — A MANUAL OF OTOLOGY, RHINOLOGY AND LARYNGOLOGY; Gifford — OCULAR THERAPEUTICS; Wohl and Goodhart —MODERN NUTRITION IN HEALTH AND DISEASE; Bonica — THE MANAGEMENT OF PAIN; and others.

Lederle Laboratories Division, American Cyanamid Company, Pearl River, N. Y. **Booth R-5**

Your Lederle representative will be on hand to serve you. He can furnish information on any Lederle product and is prepared to bring to bear on any of your medical problems the knowledge of the worldwide Lederle research organization.

Liberty Optical Manufacturing Company, Inc., Newark, N. J. **Booth 90A**

J. B. Lippincott Company, Philadelphia
Booth 49

J. B. Lippincott Company presents, for your approval, a display of professional books and journals geared to the latest and most important trends in current medicine and surgery. These publications, written and edited by men active in clinical fields and teaching, are a continuation of more than 100 years of traditionally significant publishing.

Little, Brown & Company, Boston
Booth R-10

Little, Brown and Company invites you to come by Booth R-10 to see the first two completed issues in the new quarterly book series: INTERNATIONAL OPHTHALMOLOGY CLINICS. These are (1) OCULAR THERAPEUTICS edited by Irving H. Leopold, and (2) CONTACT LENS MANAGEMENT edited by Morgan B. Raiford.

In addition to the IOC series, we will have several important new ophthalmologic monographs on display, as well as a major work of interest to otolaryngologists — HENRY FORD HOSPITAL INTERNATIONAL SYMPOSIUM: OTOSCLEROSIS. This book has just been published.

P. Lorillard Company, New York
Booth 403

P. Lorillard Company invites you to visit the Kent Cigarette exhibit.

We are presenting the story of Kent

Cigarettes. A big part of that story is why you'll feel better about smoking with the taste of Kent.

Kent with the Micronite filter refines away harsh flavor — refines away hot taste — makes the taste of a cigarette mild.

A table cigarette box with your signature in gold will be a pleasant souvenir of your visit to the convention.

Mager & Gougelman, Inc., Chicago
Booths 20 and ½ of 19

Our conveniently located offices in principal cities; our highly skilled technicians, who visit outlying areas regularly, and our extensive mail order services bring to you the advanced techniques of artificial eyes in glass and plastic as handed down through generations for the past 110 years.

We welcome the opportunity to serve your many needs by discussing your problems at any of our facilities as well as presenting to you at Booth 20 our complete line of glass eyes, plastic eyes, precorneal lenses, cosmetic lenses, facial restorations, implants, conformers and anatomical eye models.

Arrangements made at our booth to visit our laboratory to see a demonstration of glass eye blowing by a master artist.

Maico Electronics, Inc., Minneapolis
Booths 69 and 70

Booths 69 and 70 will feature the Maico Model MA-8 twin-channel "master" audiometer, the most advanced clinical hearing test instrument yet developed by the pioneer Minneapolis, Minnesota, hearing research and manufacturing firm. Capable of performing the latest tests, including the SISI and Rainville evaluations, the instrument will be shown installed in a special walnut "tilt-top" accessory desk, which also houses a record turntable and tape unit.

Maico Director of Audiology, Dr. Paul La Benz, will be among the representatives in attendance, who will be pleased to demonstrate the instrument and discuss the latest techniques in audiometry.

Matalene Surgical Instruments Co., Inc., New York **Booths 81 and 82**

Matalene Surgical Instruments Co., Inc., will exhibit an improved binocular gonioscope with coaxial illumination, the Chamlin perimeter, tonometers, trial frames, and the newest developments in forceps, scissors, cutting instruments, instrument cases, etc., as well as the standard patterns.

McLeod Optical Co., Inc., Providence, R. I.
Booth R-48

The McLeod Optical Company will again feature its world-famous I-Gard plastic lenses and subnormal vision aids. This year we will exhibit for the first time the new I-Gard plastic trifocal, a first in the world of plastic. This amazing new lens provides comfort, as it is 40 to 60 per cent lighter and also provides full width, intermediate, and reading additions with no light reflections. We also will have on display a complete line of subnormal vision aids from 4 diopters to 54 diopters. In addition we will have the new Christensen lens for indirect ophthalmoscopy which features light weight and distortionless vision.

On hand to welcome you to this meeting will be Norman A. MacLeod, Sr., Edwin A. McLeod, and Norman A. MacLeod, Jr.

Medical Case History Bureau, New York
Booth 115

A few minutes spent at this booth may prove of real value in simplifying and modernizing your office record system. Efficient history record charts, bookkeeping cards, automatic cross-indexing diagnostic files, are the features at this booth, as well as steel filing equipment to house your records. The Info-Dex Cancer Registry System for use in your hospital will also be on display.

Medical Contact Lens Service, Milwaukee
Booth 745

Medical Film Guild, Ltd., New York
Booth L-L

Medical Film Guild, Ltd., 506 West 57th Street, New York 19, in celebrating its twenty-second consecutive Academy Meet-

ing since 1940, announces the addition of two new films:

DIABETES AND ITS LONG RANGE CONTROL

with interesting references for the ophthalmologist on diabetic retinopathy... glaucoma... and showing use of the tonometer.

BLOOD FLOW

Newer Techniques for Measurement in Various Vascular Beds

reviews the research of seven universities in electronic measurement of blood flow in the brain... the eye... the ear... and the extremities.

Inquire about our films OCULAR BACTERIOLOGY, OCULAR BIOMICROSCOPY and OCULAR PERIMETRY, for your local ophthalmological society or general hospital staff conference.

In Rhinology we offer:

THE HUMAN NOSE — WHAT MAKES IT DIFFERENT?
THE NOSE AND PARANASAL SINUSES

Investigate how "Medical Film of the Month" (we have both professional and lay series) may be used for your hospital teaching and lecture programs. Also series on "Nurses' Training Film of the Month."

Visit our exhibit for the latest in audio-visual equipment... Geloso dictation and transcription recorders... Vu-Graphs... opaque projectors, etc.

Be sure to see our "Humor in Medicine" display. Each caricature, hand carved figurine or wall plaque will give you a chuckle and remind you of someone, you have met.

Merck Sharpe & Dohme, Division of Merck & Company, Inc., West Point, Pa.
Booth 45

A new adrenocortical steroid is featured at the Merck Sharp & Dohme booth. 'DECADRON' dexamethasone possesses all the basic actions and effects of other glucocorticoids but in different degree. Its anti-inflammatory activity is more potent on a weight basis than any other known glucocorticoid. Electrolyte imbalance is not ordinarily a therapeutic problem.

'HydroDIURIL', a new, orally effective, nonmercurial diuretic-antihypertensive agent is also of interest. This compound is the most potent diuretic agent presently available equaling or exceeding even the most potent parenteral organomercurials in diuretic activity.

Technically trained personnel will be present to discuss these and other subjects of clinical interest.

Miles Reproducer Co., Inc., New York
Booth 427

Newest "Walkie-Recordall" self-powered transistorized recorder-transcriber is now smaller, lighter and fits desk drawer or Miles briefcase.

Records examinations, case histories, staff meetings, lectures, house calls, hospital rounds, conferences, group therapy, surgical operations, telephone, dictation.

Picks up and records even in the closed briefcase within a 60-foot radius, screening outside interferences or noises.

Provision for dictating in noisiest places whereby the voice spoken into the mike even in a whisper comes through clearly, eliminating all other voices or noises.

Automatic "self-start-stop" feature starts recording automatically, without supervision — stops recording within six to eight seconds after voice or telephone stops. Permits more recording on a Sonaband and eliminates listening to idle moments.

Sonabands have a recording continuity up to 90 minutes and may be slowed down to approximately two and a half hours on each side of the belt — a total recording capacity of 5 hours.

Recordings are permanent, indexed, fileable and mailable. Cost less than any conventional method of recording.

While transcribing facilities may be had with same unit, the need for transcribing may be reduced or even completely eliminated, since the Sonabands which are permanent are indexed-Go-on-off the recorder in 2 seconds and provide most accurate file. 100 Sonabands (500 recording hours) fit a box measuring 2 x 2 x 8 inches.

Your "Electronic Secretary" is always with you wherever you go. Take it with you to the lectures, office, home, hospital, bedside of patient, meeting, car, train, plane. No wires — no plugs — no exposed mike — saves time for you and your secretary.

Miller Surgical Co., Chicago Booth 89

See the Miller Electro-Scalpel, Radiotherm and Surgidyne with Snares, Suction-Coagulation attachments and other special accessories for Eye, Ear, Nose and Throat procedures. Also on display, illuminated Otoscopes, Ophthalmoscope, Eyespud with magnet, Transilluminating lamps, Lempert-type Headlite and the Variable Wall Rayostat which converts battery operated equipment to electric.

Modern Optics, Division of Shuron Optical Company, Houston Booths 72 and 73

The C. V. Mosby Company, St. Louis Booth 88

New knowledge, new ideas, new research and technique — all are waiting for you in the newest Mosby books for 1961. Come in. Look over these books at your leisure and convenience. If you wish his assistance, our experienced representative will be happy to discuss any book with you.

V. Mueller & Company, Chicago Booths 1 through 5

The Michelson-Sequoia Air Drill, for stapes mobilization and related endaural procedures, will be a major feature of V. Mueller & Company's large display of the latest instruments and equipment for this type of surgery. The Mueller Zeiss (Shambaugh-Derlacki) Operating Microscope will be another major feature demonstrated. The improved Model MC Electronic Tonometer and the new dual Model TR Electronic Tonographer with Ophthalmodynamometer attachment will further highlight an interesting and practical collection of fine standard and special instruments for all eye, ear, nose and throat work. V. Mueller instrument specialists will welcome your instrument problems and suggestions.

Mueller Welt Contact Lenses, Inc., Chicago Booths R-39, R-40 and 760

"An ophthalmologist who does not believe that contact lenses are here to stay does not understand the motivation of the myopic maiden, the college athlete, or the patient with uniocular aphakia." (quote from an Editorial in the February 1961 Archives of Ophthalmology)

We shall demonstrate twice daily how the ophthalmologist can incorporate contact lenses into his practice by fitting patients himself or by training his own office staff.

New Era Optical Company, Chicago Booths R-3 and R-4

Nikon Inc., New York Booth 409

Obrig Laboratories, Inc., New York Booth 110

The Obrig Laboratories will present the various types of contact lenses as well as diagnostic and gonioscopic lenses.

Literature and reprints of articles will be available. Arrangements may be made for instruction in the fitting of contact lenses.

Omega Instrument Co., New York Booth 118

Ophthalmos, Inc., New York Booth R-13

You are cordially invited to visit our exhibit booth.

We will be featuring —

The STERIDROPPA in its new container. The STERIDROPPA is a sterile single dose disposable unit containing Ophthalmos solutions for surgical use. This new container is a revolutionary plastic material — clear as crystal — electronically sealed — absolutely impermeable and unaffected by liquids and gases.

ALMOCARPINE — Ophthalmos solution of Pilocarpine Hydrochloride

EPITRATE — Epinephrine Bitartrate 2%

VAS I ZINC — Zinc Sulfate ¼%

METHISOL — Methycellulose 4000 cps. ½%

FLUOR I STRIP — sterile disposable single dose fluorescein applicators

Our staff of trained representatives will be available to discuss with you the uses of these preparations in addition to other

products for ophthalmic therapy and diagnosis.

The Opticase Company, Newark, N. J.
Booth 15

Optometics, Inc., Van Nuys, Calif.
Booth 418

Otarion Listener Corporation, Ossining, N. Y. **Booth 405**

On exhibit will be Otarion Listener eyeglass hearing aids, including stereophonic, frontal, double-powered, bone conduction, tiny behind-the-ear instruments, ear canal aid, and semi-conductor single temple eyeglass aid for the severely deafened — Otarion all-in-one fully transistorized combination puretone and speech audiometer.

Parsons Optical Laboratories, San Francisco **Booths R-25 and R-26**

Parsons Optical Laboratories, the world's largest manufacturers of glaucoma equipment, will show (1) both diagnostic and surgical instruments in that field, including the Barkan-Koeppe lens and the Barkan goniotomy lens; (2) floor model gonioscopes, hand-held microscopes, the Barkan focal illuminator and operating light, and a complete display of tonometers; (3) other items of our exclusive manufacture, such as the Costenbader accommodometer and the Costenbader adjustable clip-on trial frame, Harrington pocket charts, Engel fundus contact lens, Thorpe fundus lens, and Thorpe x-ray localization lens; (4) some equipment by Haag-Streit, whom Parsons represents as West Coast distributors.

George P. Pilling & Son Company, Philadelphia **Booths 77, 78 and 79**

Pilling shows a new rechargeable dry-cell powered Battery Unit for supplying light to endoscopic and other electrical diagnostic instruments. A large assortment of Tracheostomy Tubes for use with various I. P. P. B. apparatus are also displayed.

These are but a part of the variety of standard and new model Eye, Ear, Nose, Throat, and Bronchoscopic Instruments available for your inspection.

Plastic Contact Lens Company, Chicago
Booths R-1, R-2 and 787

This year our Company will feature the Cycon lens, which has a toric base curve to fit astigmatic corneas.

This lens has been clinically tested on thousands of patients with gratifying results. The Cycon lens has reduced the patient's adaptation time, as it has exceptional centering qualities based on the Sphercon principle of a minimum tear layer equally distributed in all meridians.

Please see our display and demonstration of the Cycon lens at our booths.

We will also be featuring the Photo Electronic Keratoscope and the new W/J Compumatic. Both are instrument aids for fitting the W/J Cycon lens.

We will also have on display the W/J Sphertan lens specifically designed for aphakia patients.

Alfred P. Poll, New York **Booth 119**

Precision Contact Lens Laboratories, New York **Booth 422**

Precision-Cosmet Company, Inc., Minneapolis **Booths R-30 and R-31**

Precision-Cosmet will be displaying its complete line of automated contact lens equipment. In addition, we shall display the Allen and Iowa implants.

Having a long reputation of excellence in the artificial eye field, we shall also have on display some of our artificial eye molds.

Having recently developed a method of photographing fluorescein patterns accurately, we shall also display the slides of normal fitting patterns of patients wearing contact lenses. These slides will also be made available to the men in attendance as lecture material for any lecture they may wish to conduct.

W. F. Prior Company, Hagerstown, Md.
Booth 413

A UNIQUE AND INDISPENSABLE SERVICE FOR THE OTOLARYNGOLOGIST

In addition to the LOOSE-LEAF OTOLARYNGOLOGY and the vast number of new and revised chapters that have already been published for these volumes, you will see on display the unique OTOLARYNGOLOGY RESEARCH SERVICE. The actual requests from subscribers,

the response by way of literature supplied, and the reactions of the individual subscribers will prove how valuable this service would be to you.

Gone are the days when it was necessary for the busy specialist to spend valuable time hunting for needed references. By merely mailing a request card, the literature completely answering your question is placed on your desk.

This service is vast in its comprehensiveness and negligible in cost.

Professional Pharmacal Company, Inc., San Antonio, Texas Booth R-33

The Professional Pharmacal Company will display its complete line of BufOpto Ophthalmic Solutions.

Two new BufOpto Ophthalmic Solutions will be featured. BufOpto NEO-FLO, an Ophthalmic Irrigating Solution in the new Bellows Bottle will be shown. This solution is ideal for office irrigating procedures after tonometry, gonioscopy, removal of foreign bodies, and use of Fluorescein.

BufOpto MYTRATE, a sterile Methulose solution containing 1-Epinephrine Bitartrate 2 per cent for effective management of uncontrolled chronic simple glaucoma.

Our special representatives will be on hand to answer all questions concerning these products.

The Professional Press, Inc., Chicago Booth 52

The Eye, Ear, Nose and Throat Monthly is now in its fortieth year of publication. Its constant aim is to provide profitable reading of a practical nature for those engaged in the eye, ear, nose and throat field.

The Purdue Frederick Company, New York Booth 707

R. J. Reynolds Tobacco Company, Winston-Salem, N. C. Booths 27 and 28

Welcome to the R. J. Reynolds Tobacco Company Exhibit! You are cordially invited to receive a cigarette case (monogrammed with your initials) containing your choice of CAMEL, WINSTON Filter, Menthol Fresh SALEM, or CAVALIER King Size Cigarettes.

The Rhinopto Company, Inc., Dallas Booth 746

The Rhinopto Company cordially invites physicians to visit its booth. Featured will be Rhinall Nose Drops and Spray, a time-proven, safe nasal decongestant without burning or irritation for infants, children and adults.

Richards Manufacturing Company, Memphis Booths 741 and 742

Ritter Company, Inc., Rochester, N. Y. Booth 71

For your inspection and consideration, the Ritter Company will display the multi-use Ear, Nose and Throat Treatment Unit which puts all the essential electrical vacuum and pressure facilities at your fingertips.

As companion pieces, may we invite you to see the Ritter Chair for all EENT procedures, designed with your comfort in mind; and the new Type 9 Chair-Table, a double utility piece which, like the Chair, permits you to work at your comfort level without the bending and contorting that contributes to that "end of day" fatigue.

The Castle 777 Speedclave with time saving and safety features (for both you and your patient) can be demonstrated.

Precise and accurate control of your electrosurgical technique with the L-F 0-3 Bovie will also be explained at your request.

Roche Laboratories, Nutley, N. J. Booth 401

Sandoz Pharmaceuticals, Hanover, N. J. Booth 30

Sandoz Pharmaceuticals cordially invites you to visit our display.

MALLARIL — first potent tranquilizer with a selective action (i.e.—no action on vomiting centers). This unique action gives specific psychic relaxation with safety at all dosage levels.

CAFERGOT PB — the most effective oral medication for the relief of migraine headache with gastrointestinal tract disturbance accompanied by tension.

PLEXONAL — preferred daytime sedative-relaxant. Superior to both the barbiturates and Meprobamates.

Any of our representatives in attendance will gladly answer questions about these and other Sandoz products.

W. B. Saunders Company, Philadelphia
Booth R-35

Saunders is proud to be the publisher of the revised edition of the ATLAS OF OPHTHALMIC PATHOLOGY under the joint sponsorship of the American Academy of Ophthalmology and Otolaryngology and the Armed Forces Institute of Pathology, edited by Doctors Hogan and Zimmerman.

Schering Corporation, Union, N. J.
Booth 33

You are cordially invited to visit the Schering technical exhibit, where information on the following products may be obtained: Sodium Sulamyd, superior to any other sulfonamide in the treatment of ocular infections; Metimyd, for simultaneously combating inflammation, allergy, infection; and Metreton, for ocular allergies.

Schieffelin & Company, New York
Booth 50

Schieffelin & Co. is exhibiting several ophthalmic pharmaceutical specialties of interest to the ophthalmologist.

Outstanding among these products is CYCLOGYL. CYCLOGYL, "the drug of choice" for routine refractions, offers the physician complete clinical control.

Another product of interest is CYCLOMYDRIL, the fastest acting mydriatic, with a most profound effect. Also on exhibit are CYCLOBAR, an effective combination of cycloplegic, mydriatic and antibiotic action, and ESTIVIN, an ideal medicament for minor eye irritations.

Professional representatives from Schieffelin & Co. will be available for further discussion and service to the attending ophthalmologists.

Robert B. Scott, Chicago **Booth R-34**

1. Display of before-and-after results on ocular prostheses, cosmetic contact shells and facial restorations.

2. Display of retinal and anterior segment slides from our collection.

Shuron Optical Company, Rochester, N. Y.
Booths 83 and 84

The Shuron Optical Company Division of Textron Inc. will display its complete line of quality frames and cases. Its representatives will be glad to explain and demonstrate the importance of correctly designed and constructed ophthalmic frames, and why special lenses for occupational and sports wear should be prescribed by the doctor. Included will be the combination Ronsir and Rondon Browline frames — both in zylonite and high purity aluminum, the all zyl Rondean in solid colors and clear bridge, Widesite Corrected Curve lenses in White, Tonetex, Greentex, Neutrex and DS (Dress Safety), and the newest in spectacle cases.

Smith, Kline & French Laboratories, Philadelphia **Booth R-29**

Our representatives cordially invite you to discuss with them: (1) 'Ornade' Spansule® capsules, the unique oral nasal decongestant that contains a special drying agent in addition to a decongestant and an antihistamine; (2) Temaril® Tablets, Syrup and Spansule® capsules, the oral medication specifically for the relief of itching; (3) Teldrin® Spansule® capsules, for rapid and sustained antihistaminic effect; (4) Vasocort® 'Spraypak' — hydrocortisone and two decongestants to reduce intranasal inflammation and congestion; and (5) Trisocort® 'Spraypak' — hydrocortisone, three antibacterials and two decongestants for intranasal infections.

Smith, Miller & Patch, Inc., New York
Booths R-19 and 408

Smith, Miller & Patch, Inc., will feature LIPOTRIAD . . . A nutritional approach to therapy of certain vascular retinopathies. LIPOTRIAD has been reported effective in such conditions as senile macular degeneration, diabetic retinopathy and arteriosclerotic retinopathy. This is a potent combination of lipotropes and oxytropic B-Complex factors in liquid or capsules.

BISTRIMATE . . . a safe, effective and economical therapeutic to combat subacute, chronic or recurrent sore throats. Preliminary tissue studies indicate BISTRIMATE has an antiviral effect on Adenovirus type 3 and Adenovirus type 7. No serious reactions to BISTRIMATE have been noted in more than fifteen years' use.

Professional representatives will also discuss a new line of topical ophthalmic preparations, including QUIMOTRASE, the original alpha-chymotrypsin developed by Dr. Barraquer for enzymatic zonulolysis.

Sonotone Corporation, Elmsford, N. Y.
Booth 80

Featured in this exhibit will be the full Sonotone line of hearing aids, including ear-level, eyeglass and on-the-body types. All types incorporate Automatic Gain Control (compression amplification) to provide a desirable, fully adjustable combination of high sensitivity to weak sounds with automatically muted response to loud sounds, which might otherwise result in discomfort to the ear.

E. R. Squibb & Sons, New York
Booth R-38

E. R. Squibb & Sons has long been a leader in the development of new therapeutic agents for prevention and treatment of disease. The results of our diligent research are available to the medical profession in new products or improvements in products already marketed.

At booth R-38, we are pleased to present up-to-date information on these advances for your consideration.

Storck Pharmaceuticals, Inc., St. Louis
Booth 25

METALEX — basic in the care of the aging — combines pentylenetetrazol and nicotinic acid in elixir and tablet forms for relief of tinnitus and loss of auditory acuity, range and amplitude. Also, in visual defects due to retinal arteriosclerosis.

PENTERGOT — provides symptomatic relief in migraine, tension, histaminic cephalalgia and vascular headaches by using a synergistic combination of caffeine and ergotamine tartrate for cerebral vasoconstriction.

ECTASULE — provides sustained, long action, uniform bronchodilation and nasal decongestion for twelve hours with one dose. Patient has benefit of complete nocturnal protection, increased exercise tolerance and increased vital capacity in allergic disorders.

Storz Instrument Company, St. Louis
Booths 111 through 114

OPHTHALMOLOGISTS are invited to inspect the trouble-free, dependable STORZ-CRESCENT ELECTRONIC TONOMETER AND RECORDER.

OTOLOGISTS will have an opportunity to compare all available stapes drills, including the IMPROVED AIR BURR.

THE ZEISS SURGICAL MICROSCOPE with all available observation and photographic accessories will be displayed.

FUCHS SURGICAL STOOL, featuring cyclist's seat, formed back rest, hydraulic elevation adjustable by the surgeon while seated, will be demonstrated.

Surgical Mechanical Research, Inc., Los Angeles **Booths 90B and 91**

See the SMR model EF-22 EYE CABINET which can be used for both TREATMENT and REFRACTION. Check the number of novel features and cost.

We will again show an efficiently and conveniently arranged office which is economical in use of available space and reasonable in cost and which will maintain its appearance of newness over the years.

See the J-6 series treatment cabinets in both wall and floor models, featuring a pull-out writing shelf and divided drawers on heavy-duty nylon rollers and glides. Drawers can be removed from cabinet.

Other treatment equipment: treatment chairs, stools, cuspidors, suction and pressure apparatus, lights, tables, instrument pans, ear speculum, glassware and many other items.

SMR EAR STOPPERS models 506 and 600 will be shown.

The Thermosector Company, Oak Park, Ill. **Booth 31**

The Thermosector, an electrosurgical unit expressly designed for eye, ear, nose,

and throat techniques in office and hospital, will be exhibited and demonstrated. You are invited to investigate this device and actually see its superior performance.

See, also, the Dazor Floating Magnifier Examining Lamps which will be displayed and note how they can help you and your patients on prescription.

A line of Selsi Prismatic Binoculars and Visual Aids will also be offered. They should interest you.

Titmus Optical Co., Inc., Petersburg, Va.
Booths R-22 and R-23

Uhlemann Optical Company, Chicago
Booths 54 through 57

May we invite you to visit our Exhibit, where you will have an opportunity to inspect, at your leisure, an up-to-date, efficient display of Ophthalmic Equipment and Medical Office Furnishings.

We will also feature a complete array of Eye Wear Fashions to please the most discriminating. New designs and new colors in top quality frames.

Our staff will be on hand to present the latest Contact Lens Equipment . . . and review the story of "Contact Lenses."

In addition, there will be many individual items . . . such as practice aids, accessories, and other optical products.

You will receive a cordial welcome . . . and our Representatives will be pleased to discuss any of our services with you.

Univis, Inc., Ft. Lauderdale, Fla.
Booths 39, 40 and 407

Vicon Instrument Company, Colorado Springs, Colo. Booth 106

The Vicon Instrument Company, Colorado Springs, Colorado, will display its entire line of Prescription Quality Hearing Instruments.

Among the many instruments to be featured will be the Metricon — a calibrated decibel meter, which has proven highly effective in quickly and accurately defining instrument specifications needed by the hard of hearing individual.

The Vicon Instrument Company pioneered the use of individually supplied hearing instrument specifications and calibrations. Samples of these individual curves and specifications will also be displayed.

Vicon's instruments are designed to be dispensed according to the best known scientific methods and are recognized as the finest instruments available to those in the field of hearing enhancement.

May we invite all of those attending the Academy Meeting to stop in at the Vicon display area to view Vicon products and to discuss Vicon's method of prescribing hearing instruments.

Victory Optical Mfg. Company, Newark, N. J. Booths 103 and 104

The latest exhibit booths of Victory Optical Manufacturing Company will feature "the styles of tomorrow today," and the latest colors in fashion eyewear. All Victory frames are precision crafted and ophthalmically correct, exemplifying the most desirable features of fine fashion eyewear. The best quality and the fastest service is the password in every department.

Vision-Ease Corporation, St. Cloud, Minn.
Booth 60

The Vision-Ease Corporation will again exhibit its full line of semi-finished multifocal lens blanks. Also on display will be the Slide Rule adaptation of the "Ranges of Usable Clear Vision Chart for Multifocal Lenses," which has proven to be an attractive yet very practical aid in determining the lens additions necessary for the various vocational and avocational requirements of the presbyopic patient. Also on display will be the new Vision-Ease absorptive tint lens holder and the very popular Catarex service, which includes the temporary lenses for the fitting of the patient during the healing period following surgery and the permanent lenticular lenses of identical mechanical specifications for the final prescription.

Dr. Max. M. von Stirne, Philadelphia
Booth R-7

Wagtowne Enterprise, Inc., Chicago
Booth 406

Walton Laboratories, Inc., Irvington, N. J.
Booth R-14

Walton Laboratories, Inc. will feature their new and popular priced THERA-MIST Cold Steam Vaporizer-Humidifier. Designed for Bedside Therapy in both the home and the hospital. In addition, they will have on display their model HA Humidifier specifically designed for hospital use.

Wampole Laboratories, Stamford, Conn.
Booth 410

Wampole Laboratories will feature:

VoSol OTIC SOLUTION and VoSol-HC for the treatment and prevention of otitis externa. VoSol Otic Solution is bactericidal and fungicidal. The hydrocortisone in VoSol-HC helps reduce inflammatory swelling and relieve symptoms such as itching and pain.

RECTALAD-MIGRAINE, absorption of the ingredients which are in solution is almost immediate and relief is usually achieved within ten minutes.

AVAZYME (the first all chymotrypsin tablet) is an anti-inflammatory enzyme preparation as efficacious as an injection. Studies using human intestinal juice show chymotrypsin is from five to eight times more stable than trypsin.

Welch Allyn, Inc., Skaneateles Falls, N. Y.
Booth 17

Diagnostic instruments for the eye, ear, nose and throat, illuminated by a modern power source, will be available for inspection and demonstration.

A new Welch Allyn type laryngoscope blade will be introduced at this meeting. It will be in the family of the more popular curved type blade, but made entirely of stainless steel and offering a new strength and long lasting dependability. Also new are laryngoscope handles with a rechargeable power source which gives the user constant, brilliant illumination.

White-Haines Optical Co., Columbus, Ohio
Booths 21 and 22

The Williams & Wilkins Company, Baltimore
Booth 36

Winthrop Laboratories, New York
Booth 117

Carl Zeiss, Inc., New York
Booths 74 and 75

Carl Zeiss, Oberkochen Fundus Camera with electronic flash and Carl Zeiss, Oberkochen Operation Microscope with Photo Attachment will be again featured in our exhibit. Furthermore, the well-known Carl Zeiss, Oberkochen Slit Lamps on instrument table and compound stage, as well as accessories such as anterior chamber depth micrometer, photo attachment and gonioscopic accessories will also be displayed. In addition, the Twin Lamp, Hand Lamp, Diagnostic Set, Vertex Refractionometer and various laboratory microscopes will also be shown.

Zenith Radio Corporation, Chicago
Booths 93B and 94

Zenith will exhibit their full line of all transistor hearing aids plus their new small power pack SUPER-R hearing aid for severe hearing losses; also the Zenith portable and table model diagnostic audiometers will be exhibited.

Zylite Products Company, Inc., Long Island City, N. Y. **Booth 48**

Zylite Products Co., Inc., will display their 1961 collection of the latest in frame fashions.

Prominently featured will be CIRCA-LITE and SARENA-LITE, representing Zylite's first contribution to the gold-filled aluminum combination frame field. Both of these frame fashions represent a distinct contribution to the styling of combination frames which will appeal to women of all ages.

On hand to greet their many friends at the Academy Meeting will be Herman Lieberman, Charles Ladew, Peter Foy, Jack Hinkes and Homer Millikan.

SECTION ON INSTRUCTION

* * *

SIXTY-SIXTH ANNUAL MEETING

American Academy of Ophthalmology and Otolaryngology

October 8-13, 1961

PALMER HOUSE

Chicago, Illinois

A. D. RUEDEMANN, M.D.
Secretary for Instruction — Ophthalmology

EUGENE L. DERLACKI, M.D.
Secretary for Instruction — Otolaryngology and Maxillofacial Surgery

The following condensed schedules of instruction courses are reprinted for the convenience of Fellows who have not yet placed orders for tickets.

Courses already sold out are so designated on the charts. Please do not request tickets for these courses.

For complete listing of course titles, instructors, and descriptive paragraphs about each subject, please refer to the May-June issue of the TRANSACTIONS.

An *individual* course is complete in one (1) period. A *continuous* course runs two (2) or more periods as indicated. It is not possible to purchase a ticket to only *part* of a continuous course. Some courses are repeated on different days allowing the subscriber to choose the time when he wishes to attend.

Ordering Instruction Tickets

Only members who have paid their 1961 dues may order instruction tickets in advance of the meeting. **Members should order tickets only for their own use.** *Candidates for fellowship in the Academy are not privileged to reserve tickets in advance.* After the session opens, no distinction between members, candidates and guests will be made in selling tickets.

At the end of this section is printed a colored sheet to be used when ordering tickets in advance. Specify preferences on this sheet and mail to the executive office. Careful attention to instructions will ensure the correct filling of your requests. *Since number of tickets for each course is limited, be sure to list second and third choices for each period in case first choice is already sold out. In every case, effort will be made to furnish first choices.*

If you are requesting registration in the continuous courses, please specify preferences for individual courses as substitutes in order to avoid disappointment should the continuous courses which you select be sold out when your order is received.

Each period (1 hour) of instruction costs $2.00. *Orders not accompanied by properly executed checks will not be filled.* Checks should be made payable to W. L. Benedict, M.D., and mailed to the Academy office, 15 Second St. S.W., Rochester, Minn.

All orders for tickets will be filled according to the postmark on the envelope containing the check. Telegrams will not be honored. Orders will not be accepted for presale after September 28; to ensure acceptance they should be mailed before September 26.

Acknowledgment of Advance Order

As soon as an advance order is filled, a post card, listing the courses that have been reserved for him, will be mailed to the subscriber. Please do not ask to change courses after your order has been filled. The post card is merely an assurance that your order has been filled; it is not necessary for registration at the Academy meeting.

Claiming Instruction Tickets

No tickets will be sent through the mails. Members who have ordered instruction course tickets will register at the *Advance Order Section* of the Registration Desk during the week of the Convention to secure registration badge, tickets, and all convention material.

Tickets will be on sale during the meeting at the Instruction Desk on the Club Floor and the Seventh Floor.

Refunds

If courses requested are not available and it is impossible to substitute, a refund will be granted. A blue refund card will be placed in the Advance Registration Envelope which is received at the time of registration. This may be presented at the Instruction Desk for payment.

In case of inability to attend the meeting after order has been filled, a refund will be granted if requested prior to October 2.

If you have ordered tickets in advance, at the time of registration take your registration card to the desk marked ADVANCE ORDERS. There you will be given an envelope containing badge, tickets and program which has been prepared ahead of time to facilitate your registration.

KEY TO DESIGNATION OF PERIODS

The periods will be designated with the following key: Select tickets for — Otolaryngology, forenoons, periods 1-2-3 — Ophthalmology, afternoons, periods 4-5-6

Day	(M)onday	(T)uesday	(W)ednesday	(Th)ursday
Period a.m.		1 2 3	1 2 3	1 2 3
Period p.m.	4 5 6	4 5 6	4 5 6	4 5 6

M-4	2:00 p.m. to 3:00 p.m.	W-4	2:00 p.m. to 3:00 p.m.
M-5	3:15 p.m. to 4:15 p.m.	W-5	3:15 p.m. to 4:15 p.m.
M-6	4:30 p.m. to 5:30 p.m.	W-6	4:30 p.m. to 5:30 p.m.
T-1	9:00 a.m. to 10:00 a.m.	Th-1	9:00 a.m. to 10:00 a.m.
T-2	10:15 a.m. to 11:15 a.m.	Th-2	10:15 a.m. to 11:15 a.m.
T-3	11:30 a.m. to 12:30 p.m.	Th-3	11:30 a.m. to 12:30 p.m.
T-4	2:00 p.m. to 3:00 p.m.	Th-4	2:00 p.m. to 3:00 p.m.
T-5	3:15 p.m. to 4:15 p.m.	Th-5	3:15 p.m. to 4:15 p.m.
T-6	4:30 p.m. to 5:30 p.m.	Th-6	4:30 p.m. to 5:30 p.m.
W-1	9:00 a.m. to 10:00 a.m.		
W-2	10:15 a.m. to 11:15 a.m.		
W-3	11:30 a.m. to 12:30 p.m.		

(Familiarity with this key will be helpful and will avoid confusion)

The Following are Condensed Schedules of Courses Previously Described

CONTINUOUS COURSES — OPHTHALMOLOGY

COURSE NO.	SPEAKER	SUBJECT	PERIODS
1	Allen et al.	Bacteriology & Infectious Diseases	8 PERIODS M-4, M-5, T-4, T-5 W-4, W-5, Th-4, Th-5
2	Ascher	Aqueous Veins in Glaucoma	2 PERIODS M-4, M-5
3	Ballintine & Purnell	.....SOLD OUT.....	
4	Becker & Kinsey	Studies of Aqueous Flow	2 PERIODS T-4, T-5
5	Bedell	Ophthalmoscopy	3 PERIODS M-4, T-4, W-4
6	Berliner	Recent Advances in Biomicroscopy	3 PERIODS M-6, T-6, W-6
7	Boeder	Practical Optics	2 PERIODS Th-4, Th-5
8	Braley	Fundus Lesions	2 PERIODS W-5, W-6
9 or		.....COURSE 9 SOLD OUT.....	3 PERIODS
10	Brockhurst & Regan, C.	Indirect Ophthalmoscopy	W-5, W-6 Choice of Th-5, Th-6
11	Brown et al.	Eye Muscles	8 PERIODS M-4, M-5, T-4, T-5 W-4, W-5, Th-4, Th-5
12	Byrnes	Ophthalmic Filters	2 PERIODS T-5, T-6
13	Callahan et al.	Ophthalmic Plastic Surgery: Fundamentals	9 PERIODS M-5, M-6, T-5, T-6, W-5, W-6, Th-4, Th-5, Th-6
14	Castroviejo et al.	Keratoplasties	6 PERIODS W-4, W-5, W-6 Th-4, Th-5, Th-6
15	Clark, G.	..... CANCELLED	
16	Constantine et al.	Contact Lenses	6 PERIODS T-4, T-5, W-4 W-5, Th-4, Th-5
17	Cooper	Principles of Ocular Muscle Surgery	2 PERIODS M-5, M-6
18 or 19	Copeland	Streak Retinoscopy	4 PERIODS M-4, M-5, T-4, T-5 or W-4, W-5, Th-4, Th-5
20	Costenbader	Muscle Problems	2 PERIODS M-4, M-5
21	DeVoe et al.	Reconstructive Surgery of the Lids & Conjunctiva	3 PERIODS Th-4, Th-5, Th-6
22	Ferrer	Contact Lenses	2 PERIODS Th-4, Th-5
23	Fonda & Sloan	Subnormal Vision	2 PERIODS M-4, M-5
24	Friedman	Binocular Indirect Ophthalmoscopy	2 PERIODS M-6, T-6

CONTINUOUS COURSES — OPHTHALMOLOGY

COURSE NO.	SPEAKER	SUBJECT	PERIODS
25	Gibson et al.	Surgery of Heterotropia	4 PERIODS T-5, T-6, W-5, W-6
26	Girard & Fletcher	Pleoptics	2 PERIODS M-5, M-6
27	Hughes et al.	Ophthalmic Plastic Surgery: Advanced	9 PERIODS M-4, M-5, T-4 T-5, W-4, W-5 Th-4, Th-5, Th-6
28	Iliff et al.	Ptosis	3 PERIODS W-4, W-5, W-6
29	Jampolsky	Management of Esodeviations	2 PERIODS Th-5, Th-6
30	Jardon & Laubheimer	Fitting Ocular Prostheses	2 PERIODS W-5, W-6
31	Jones, L.	The Lacrimal Apparatus	2 PERIODS W-5, W-6
32	Knighton et al.	Practical Essentials of Glaucoma	9 PERIODS M-4, M-5, M-6 T-4, T-5, T-6 W-4, W-5, W-6
33	Kuhn et al.	Industrial Ophthalmology	3 PERIODS T-4, W-4, Th-4
34	Leinfelder et al.	Diagnostic Aids in Neuro-ophthalmology	3 PERIODS Th-4, Th-5, Th-6
35	Lemoine et al.	Fundus Lesions	3 PERIODS M-4, M-5, M-6
36	Linksz	..... CANCELLED	
37	Lloyd	..... CANCELLED	
38	Masters, R., et al.	Slit Lamp Biomicroscopy: Fundamentals	9 PERIODS M-4, M-5, M-6 T-4, T-5, T-6 W-4, W-5, W-6
39	McLean et al.	.....SOLD OUT.....	
40	Parks & Albert	Eso-Deviations	4 PERIODS W-5, W-6, Th-4, Th-5
41	Pierce et al.	Retinal Detachment	6 PERIODS M-4, M-5, T-4, T-5 W-4, W-5
42	Posner & Gorin	.....SOLD OUT.....	
43	Prewitt	Diagnosis & Therapy of Ocular Allergy	2 PERIODS W-5, W-6
44	Reese et al.	Clinical Aspects of Ocular Tumors	3 PERIODS T-4, T-5, T-6
45	Roberts	Glaucoma	2 PERIODS M-4, M-5
46	Rolett	Gonioscopy	2 PERIODS W-4, W-5
47	Romaine	Refraction Problems & Treatment	3 PERIODS M-6, T-6, W-6
48	Romaine	Ocular Motility Surgery	4 PERIODS M-4, M-5, T-4, T-5

CONTINUOUS COURSES — OPHTHALMOLOGY

COURSE NO.	SPEAKER	SUBJECT	PERIODS
49	Rosenthal	Binocular Indirect Ophthalmoscopic Technique	2 PERIODS W-4, W-5
50	Rossby & Salvatori	Contact Lenses	2 PERIODS Th-5, Th-6
51	Ruedemann & Noell	Clinical Electroretinography	2 PERIODS W-5, W-6
52	Ruedemann et al.	.....SOLD OUT.....	
53	Schepens	Recent Advances in Retinal Detachment	3 PERIODS T-6, W-6, Th-4
54	Schimek & Bousquet	Clinical Gonioscopy & Tonography	2 PERIODS Th-4, Th-5
55	Schlaegel & Hungerford	Uveitis	2 PERIODS Th-4, Th-5
56	Schlossman & Priestley	Pleoptics	2 PERIODS T-5, T-6
57	Sloane	School Vision Testing	2 PERIODS T-4, T-5
58	Sloane	Telescopic Lenses	2 PERIODS W-4, W-5
59	Gettes	A. Prescription of Prisms B. Drugs in Refraction	2 PERIODS Th-4, Th-5
60	Steinmetz et al.	Ocular Emergencies	3 PERIODS M-4, M-5, M-6
61	Stow & Moss	Diagnostic & Therapeutic Office Procedures	2 PERIODS M-5, M-6
62	Theobald et al.	Histopathology	12 PERIODS M-4, M-5, M-6, T-4 T-5, T-6, W-4, W-5 W-6, Th-4, Th-5, Th-6
63	Thorpe & Berman	Intraocular Foreign Bodies	2 PERIODS W-4, W-5
64	Thorpe et al.	.....SOLD OUT.....	
65	Thorpe et al.	Slit Lamp Gonioscopy	6 PERIODS M-4, M-5, M-6 T-4, T-5, T-6
66	Townes	Cataract Surgery	2 PERIODS Th-4, Th-5
67	Troutman et al.	Recent Advances in Ophthalmology	8 PERIODS M-5, M-6, T-5, T-6 W-5, W-6, Th-5, Th-6
68	Troutman	Enucleation Surgery	2 PERIODS Th-5, Th-6
69	Wadsworth & Colyear	Retinal Detachment	4 PERIODS M-6, T-6, W-6, Th-6
70	Wheeler & Knapp	Concomitant Strabismus	4 PERIODS T-5, T-6, W-4, W-5
71	Wise	Retinal Diseases	2 PERIODS Th-4, Th-5
72	Home Study Course Discussion Periods		12 PERIODS M-4, M-5, M-6, T-4 T-5, T-6, W-4, W-5 W-6, Th-4, Th-5, Th-6

SCHEDULE OF INDIVIDUAL COURSES—OPHTHALMOLOGY—Monday

Key M-4 — 2:00 p.m. to 3:00 p.m.

Course No.	SPEAKER	SUBJECT
103	Alvis	Glaucoma Surgery
122	Calhoun	Epithelization of the Anterior Chamber
125	Cassady	Toxoplasmic Retinochoroiditis
125-A	Casten	Orbital Lesions
132	Cohoe	Reading Instruction for Partially Seeing Children
143	Diskan	Eye Screening in Schools
150	Everett	Retinal Detachment
151	Fernandez	Beta Radiation in Pterygium Surgery
156	Frayer	Retained Lens Protein After Operation & Trauma
171	Hilding	Practical Analysis of Mechanics of Vitreous Motion
178	Joy	Chronic Glaucoma
192	Leopold & Apt	.....SOLD OUT.....
199	MacLean	Cataracts
220	Perera	Retinal Detachment
221	Pfeiffer & Jones, I.	Roentgenography of the Eye & Orbit
231	Rychener	The Lacrimal Apparatus
235	Scarney	Slit Lamp Biomicroscopy
236	Scheie	Congenital Glaucoma

Key M-5 — 3:15 p.m. to 4:15 p.m.

Course No.	SPEAKER	SUBJECT
107	Bahn	Orbital Disease
121	Buxton	Total & Partial Keratectomies
131	Cleasby	Iris Tumors
141	Day	Medical Exophthalmos
144	Duke	Lesions of the Lids
146	Dunlap	Divergence Anomalies
149	Ellis	Removal of Intraocular Foreign Bodies
164	Gipner	Recent Advances in Ophthalmic Surgery
165	Givner	Ophthalmo-Iatrogenic Disorders
165-A	Jungschaffer	Biomicroscopy of the Fundus
225	Reese	Cataract Extraction
230	Rundles	Streak Retinoscopy
240	Simpson	Hemorrhage into the Vitreous
245	Spaeth, P., & Carmichael	Ocular Tumors

Key M-6 — 4:30 p.m. to 5:30 p.m.

Course No.	SPEAKER	SUBJECT
102	Allen, H.	Aseptic Technique in Ophthalmology
123	Carroll	Optic Nerve Lesions
129	Cholst	Central Fields
137	Cunningham	Types of Head Pain
139	Daily	Biomicroscopy of Vitreous & Fundus Oculi
142	DeVoe	Surgery of Trauma
152	Fink, W.	Binocular Problems in Routine Refraction
155	Fox	Senile Ectropion & Entropion
163	Gifford	Local Anesthesia with Special Reference to Deep Motor Block
167	Haik	Mechanics of Intracapsular Cataract Extraction
170	Henderson	Intracranial Arterial Aneurysms
173	Hunt	Problems in Accommodation
174	Jacobson	Electroretinography
179	Kasper	Dacryocystorhinostomy
185	Kornzweig	Clinical Embryology
200	Mangold	Proper Fitting of Glasses
249	Tassman	Eye Involvement in Systemic Diseases
250	Theodore	Ocular Therapeutics
255	Veirs	External Dacryocystorhinostomy & Corrective Procedures for Epiphora
257	Weisser	Repair of Corneal Injuries
258	Wendland	Magnetic Intraocular Foreign Bodies

SCHEDULE OF INDIVIDUAL COURSES—OPHTHALMOLOGY—Tuesday

Key T-4 — 2:00 p.m. to 3:00 p.m.

Course No.	SPEAKER	SUBJECT
104	Andrew	Eye Diseases in Children
111	Berke	Various Lid Procedures
114	Block	Office Practice of Ophthalmology
120	Buesseler & Keats	Ophthalmic Radiology
122	Calhoun	Epithelization of the Anterior Chamber
124	Cassady	Dacryocystitis & Lacrimal Drainage
148	Egan	Cross Cylinder
153	Fink, W.	Vertical Muscle Surgery
157	Fread	Ideal Refraction Equipment
166	Hague et al.	Local & General Anesthesia in Ophthalmology
189	Leinfelder	Perimetry & Use of Tangent Screen
193	Lepard	Eye Diseases Common to Children
202	Mann, W.	Interpretation of Functional Visual Impairment
213	Naquin	Dislocation of the Lens
226	Regan, E.	Cataract Surgery
229	Ruedemann	The Differential Diagnosis & Surgical Correction of Vertical Muscle Defects
242	Smith, J. L.	Neuro-ophthalmology
244	Spaeth, E.	Complicated Ptosis
260	Wood	Macular Lesions
261	Young & Dixon	Contact Lenses

Key T-5 — 3:15 p.m. to 4:15 p.m.

Course No.	SPEAKER	SUBJECT
108	Bannon	Aniseikonia
113	Bettman	Value of Goniotomy
130	Clark, W.	Surgery of Ocular Muscles
140	Davis	Sutures in Cataract Surgery
146	Dunlap	Divergence Anomalies
160	Gartner	Fundus Diseases
162	Gibbons	Educational Management of Partially Seeing Children
182	Kennedy	Ocular Manifestations of Systemic Diseases
188	Leahey	Corneal Transplantation
191	Leopold	Advances in Ophthalmic Therapy
211	Morrison	Glaucoma
218	Paton	Corneal Surgery
222	Pico	Dacryocystorhinostomy
241	Smith, B.	Fractures of the Orbit
253	Uihlein & Kerr	Management of Head & Face Pains

Key T-6 — 4:30 p.m. to 5:30 p.m.

Course No.	SPEAKER	SUBJECT
133	Coles	Office Management of Uveitis
139	Daily	Biomicroscopy of Vitreous & Fundus Oculi
158	Fry	Inflammatory & Degenerative Lesions at Posterior Pole of the Eye
161	Gemeroy	External Diseases
164	Gipner	Recent Advances in Ophthalmic Surgery
177	Johnson, C. C.	Ptosis
194	Levy	Practical Uses of Contact Lenses
205	Martens & Dyer	Special Occupational Problems in the Presbyopic Patient
206	McCannel	Efficiency in the Office
207	McGraw	Contact Lenses
210	Merriam	Radiotherapy in Ophthalmology
212	Murrah	Aids for Subnormal Vision
227	Rizzuti	Tumors of the Lids & Ocular Adnexa
232	Salleras	Corneal Surgery
233	Samuels	Pathological Sections for the Clinician
234	Sarrail	Plastic Lid Surgery
247	Sutliff	Practical Fitting of Corneal Lenses
252	Truhlsen	Home Orthoptics
254	Vail	Senile Cataract

SCHEDULE OF INDIVIDUAL COURSES—OPHTHALMOLOGY—Wednesday

Key W-4 — 2:00 p.m. to 3:00 p.m.

Course No.	SPEAKER	SUBJECT
105	Asbury	Practical Genetics in Everyday Office Practice
116	Bonaccolto	Enucleation Techniques
118	Breakey	Rehabilitation in Ophthalmology
119	Breinin	Electromyography
124	Cassady	Dacryocystitis & Lacrimal Drainage
126	Chamberlain	Vertical & Horizontal Components of Strabismus
128	Chandler	Surgical Complications of Glaucoma
135	Coston	Inflammatory & Degenerative Diseases of the Retina
138	Cusick	Ptosis Surgery
145	Dunlap	Accommodative Esotropia
169	Hedges	Headache
175	Jaeckle	Nonstrabismic Motor Abnormalities
176	Jobe	Ophthalmic Instruments
189	Leinfelder	Perimetry & Use of the Tangent Screen
190	Lennon	Angle Closure Glaucoma
196	Lloyd	..... CANCELLED .....
201	Mann, M.	Neurologic Disorders of Motility
243	Spaeth, E.	Surgery of Horizontal Duction Defects
246	Sugar	Classifications of Glaucoma
256	Weingeist	Lacrimal Sac Surgery

Key W-5 — 3:15 p.m. to 4:15 p.m.

Course No.	SPEAKER	SUBJECT
101	Aebli	End Results of Muscle Surgery
109	Bannon	Practical Aspects of Multifocal Corrections
110	Belmont	Refraction
127	Chamlin	Perimetry
134	Colyear	Problems with Light Therapy
159	Galin	Osmotic Therapy in Ophthalmology
180	Katz, D.	Ophthalmic Anatomy
184	Klien	Clinical Pathology of the Retina
207	McGraw	Contact Lenses
208	McGuire	Cataract
219	Paulson	Lighting for Comfortable & Accurate Seeing
224	Potts	Ophthalmic Toxicology

Key W-6 — 4:30 p.m. to 5:30 p.m.

Course No.	SPEAKER	SUBJECT
106	Ascher	Cyclodialysis
112	Bettman	Radioactive Isotopes
117	Brav	Serous Choroidal Detachment
168	Halberg	Tear Formation
181	Katz, I.	Common Eye Diseases of Dogs & Their Therapy
186	Kronenberg	Practical Ocular Therapeutics
187	Kronfeld	Present Trends in Ocular Pharmacology
195	Lewis	Mechanical Visual Aids
198	Lubkin	Psychosomatic Aspects of Ophthalmology
204	Marshall	Differential Diagnosis & Treatment of Infections of Lids
209	McLean	Selection of Surgical Procedures
214	Newell & Goren	Radioactive Isotopes in Ophthalmology
215	Ogle	Stereopsis
239	Simonton	Orbital Surgery
248	Tait	Heterophoric Asthenopta
253	Uihlein & Kerr	Management of Head & Face Pains
259	Weston	Astigmatism

SCHEDULE OF INDIVIDUAL COURSES—OPHTHALMOLOGY—Thursday

Key Th-4 — 2:00 p.m. to 3:00 p.m.

Course No.	SPEAKER	SUBJECT
115	**Bonaccolto**	Dacryocystorhinostomy
136	**Cowen**	Pool Gonioscopy
147	**Edwards**	Abnormal Effects of Prescribed Lenses on Extrinsic Muscles
154	**Forbes**	Cyclodiathermy
172	**Hill, H.**	Cataract Surgery
183	**King**	Lamellar Corneal Transplantation
186	**Kronenberg**	Practical Ocular Therapeutics
197	**Long**	Retinoblastoma & the Pseudoretinoblastomas
203	**Marks**	Electrical Currents Used in Ophthalmology
216	**Ogle**	Binocular Oculomotor Coordination & Imbalances
217	**Olson**	Iritis, Iridocyclitis, Keratitis
223	**Post**	Refinements of Refraction
228	**Rubin**	Aims in the Management of Squint
238	**Shipman**	Retinal Detachment Surgery
251	**Trent**	Progress in Ophthalmology

CONTINUOUS COURSES AND PANEL DISCUSSIONS
OTOLARYNGOLOGY

COURSE NO.	SPEAKER	SUBJECT	PERIODS
301	Anderson et al.	Rhinoplasty	2 PERIODS Th-1, Th-2
302	Baron	Tympanoplastic Procedures	2 PERIODS Th-1, Th-2
303 or 304	Conley & Lenz	Carcinoma of Head & Neck	2 PERIODS T-1, T-2 or W-1, W-2
305	Converse	Principles of Corrective Nasal Plastic Surgery	2 PERIODS T-2, T-3
306	Fox & Glorig	Noise in Industry	2 PERIODS T-2, T-3
307	Godlowski	I. Physiopathology of Endocrine System II. Enzymatic Mechanism of Allergy	2 PERIODS T-2, T-3
308	Godlowski	Endocrinopathies	2 PERIODS Th-2, Th-3
309	Guilford & Wright	Techniques of Tympanoplasty	2 PERIODS W-1, W-2
310	Hansel	Allergy & Medical Otolaryngology	2 PERIODS T-2, T-3
311	Harbert	Clinical Audiology	2 PERIODS T-1, T-2
312	Hardy & Hardy	Clinical Audiology for Children	2 PERIODS W-2, W-3
313	House, H., et al.	Reconstructive Surgery for Chronic Ear Disease	2 PERIODS W-1, W-2
314	Johnson, K., et al.	Emergencies in Otolaryngology	2 PERIODS Th-1, Th-2
315	Kazanjian et al.	Traumatic Injuries of the Face	2 PERIODS W-2, W-3
316	Lawrence	Acoustic Principles in Middle Ear Surgery	2 PERIODS W-2, W-3
317	Ogura & Som	Laryngeal Surgery	2 PERIODS Th-1, Th-2
318	Simonton et al.	What the Otologist Should Know About Hearing Aids	2 PERIODS T-2, T-3
319	Sisson et al.	Team Judgment in the Management of Head & Neck Cancer	2 PERIODS T-2, T-3
320	Som & Lewin	Reconstructive Procedure in Management of Head & Neck Tumors	2 PERIODS W-2, W-3
321	Walsh	What Can Be Done for Deafness	2 PERIODS Th-1, Th-2
322	Home Study Course Discussion Periods		3 PERIODS T-1, T-2, W-1

SCHEDULE OF INDIVIDUAL COURSES—OTOLARYNGOLOGY—Tuesday

Key T-1 — 9:00 a.m. to 10:00 a.m.

Course No.	SPEAKER	SUBJECT
401	Alexander	The Adenoid Problem
424	Compere	Radiologic Examination of Mastoid, Middle Ear & Eustachian Tube
428	DeWeese	The Problem of the Dizzy Patient
431	Farrior, J. B.	Tympanoplasty: Surgical Pathology & Technique
440	Furstenberg	Management of Nasal Obstruction
444	Goodhill & Harris, I.	Stapes Surgery: Perichondral Graft
448	Guilford & Wright	Obliterative Techniques in Mastoid & Tympanoplasty Cavities
450	Hallberg	Newer Methods of Treatment of Severe Epistaxis
452	Harkins	Routine Office Management of Allergic Patients
459	Jones, E.	External Otitis: 1961
466	Kos	Vein Plug Stapedioplasty
470	Lemon	Serous Otitis Media in Children
473	Lore	Vascular Surgery in Head & Neck
475	McNally	Labyrinthine Tests
488	Rinkel	The Diagnosis of Food Allergy
503	Skolnik	Electrodiagnosis in Facial Nerve Paralysis
514	Wallner	Surgery of Tonsils & Adenoids

Key T-2 — 10:15 a.m. to 11:15 a.m.

Course No.	SPEAKER	SUBJECT
432	Farrior, J.	Stapes Operations—1961
438	Fowler	Facial Paralysis
451	Hallberg	Sudden Deafness & Its Implications
454	Hilsinger	Vascular Headaches
463	Kelemen	Pathology of Congenital Deafness
477	Montgomery	Arthritis of Larynx
479	Pastore	The Throat: Functional Problems
486	Rawlins	The Corticosteroids in Otolaryngology
491	Rosen	Is There a Single Stapes Procedure Preferable for All Cases of Otosclerosis?
501	Shambaugh	Surgical Applications of the Mechanism of the Middle Ear
513	von Leden & Moore	Current Trends in Office Laryngology

Key T-3 — 11:30 a.m. to 12:30 p.m.

Course No.	SPEAKER	SUBJECT
404	Altmann & Waltner	Treatment of Meniere's Disease with Ultrasonic Waves
405	Anson	Developmental & Adult Anatomy of Ear & Temporal Bone in Relation to Problems of Endaural Surgery
409	Bateman	Trans-sphenoidal Hypophysectomy: Combined Septal and Ethmoidal Approach
415	Bolotow	Rhinoplasty: Recent Concepts
427	Devine	Total Laryngectomy: Anatomy & a Technique
445	Gorney	Septum Surgery in the Twisted Nose
446	Grandon	Practical Surgical Procedures
460	Jordan, R.	Meniere's Disease
461	Juers	Office Tympanic Perforation Closure
482	Proctor	Tympanoplasty
502	Shea	Fenestration of the Oval Window
507	Tabb	Closure of Tympanic Membrane Perforations with Vein Grafts
508	Tonndorf	Patho-Physiology of Bone Conduction & Its Clinical Implication
511	Trible	Minimizing Deformity in Tumor Surgery of Head & Neck

SCHEDULE OF INDIVIDUAL COURSES—OTOLARYNGOLOGY—Wednesday

Key W-1 — 9:00 a.m. to 10:00 a.m.

Course No.	SPEAKER	SUBJECT
402	Alfaro	Fullness in the Ear
406	Armstrong	Use of Vinyl Tubing in the Treatment of Chronic Secretory Otitis Media
416	Bradley	Practical Office Speech Audiometry
421	Ciell	Hypnosis in Otolaryngology
424	Compere	Radiologic Examination of Mastoid, Middle Ear & Eustachian Tube
428	DeWeese	The Problem of the Dizzy Patient
436	Fitz-Hugh & McLean	Salivary Glands: Common Disorders
437	Flynn	Chronic Sinusitis
442	Goldman, I.	Correction of the Deviated Nose
444	Goodhill & Harris, I.	Stapes Surgery: Perichondral Graft
466	Kos	Vein Plug Stapedioplasty
489	Rinkel	Diagnosis of Inhalant Sensitizations
494	Scheldrup	Applied Anatomy of the Neck
495	Schlosser	Surgery of Chronic Otitis Media & Mastoiditis
498	Sellers	Headache: Otorhinologic Causes & Cure
507	Tabb	Closure of Tympanic Membrane Perforations with Vein Grafts
509	Torok	Technique of Nystagmography

Key W-2 — 10:15 a.m. to 11:15 a.m.

Course No.	SPEAKER	SUBJECT
413	Bellucci	Surgery of Stapes & Oval Window
418	Brodnitz	Nodules, Polyps & Contact Ulcer of the Larynx
443	Goldman, J.	Opportunities for Intranasal Surgery
461	Juers	Office Tympanic Perforation Closure
465	Kirchner	Facial Bone Injuries
467	Kraus & Furey	Adventures in Space
469	Lederer	Diagnostic & Therapeutic Pitfalls in ENT Practice
471	Lewy	Direct Laryngoscopy with Stability, Accuracy & Ease
480	Perlman, H.	Fluid in the Middle Ear
481	Petryshyn	The Fractured Mandible
490	Ronis	Pitfalls in Stapes Surgery
496	Schuknecht	Stapedectomy for Otosclerosis
515	Woodman	Vocal Cord Surgery

Key W-3 — 11:30 a.m. to 12:30 p.m.

Course No.	SPEAKER	SUBJECT
405	Anson	Developmental & Adult Anatomy of Ear & Temporal Bone in Relation to Problems of Endaural Surgery
412	Bell	Correction of Outstanding Ears
417	Brenman	Photography with the Operation Microscope
422	Cocke	Salivary Gland Tumors
423	Cody	Present Day Concepts in Major Sinus Surgery
425	Corgill	Radical Hypopharyngeal Surgery & Chemotherapeutic Arterial Infusion Technique
426	Derlacki, Shambaugh & Harrison	Conservative Stapes Surgery
430	Erich	Fractures of the Facial Bones
433	Farrior, R.	A Method of Otoplasty
447	Guggenheim	Technique & Pitfalls of Adenoidectomy
460	Jordan, R.	Meniere's Disease
468	Lake	Secretory Otitis Media in Children
482	Proctor	Tympanoplasty
487	Reed	Neck Dissection
500	Senturia & Adler	What's New in the Treatment of External Otitis?

SCHEDULE OF INDIVIDUAL COURSES—OTOLARYNGOLOGY—Thursday

Key Th-1 — 9:00 a.m. to 10:00 a.m.

Course No.	SPEAKER	SUBJECT
403	Alfaro	Plans for the Office
407	Atkins	Bronchoscopic Problems of Infancy & Childhood
414	Blatt	Diseases of the Salivary Glands
420	Carhart	Tests for Malingering
421	Ciell	Hypnosis in Otolaryngology
442	Goldman, I.	Correction of the Deviated Nose
448	Guilford & Wright	Obliterative Techniques in Mastoid & Tympanoplasty Cavities
455	Hough	Partial Stapedectomy
472	Loch	Septum Deviations
474	McHugh	Surgical Treatment of Traumatic Conductive Deafness & Facial Paralysis
476	Missal	Cervico-Occipital Syndrome
483	Proctor	Surgical Anatomy of Temporal Bone
484	Proud	Middle Ear Effusion
505	Spector	Dizziness
506	Sullivan, Smith & McAskile	Facial Palsies & Their Treatment
510	Torok	Evaluation of the Nystagmogram

Key Th-2 — 10:15 a.m. to 11:15 a.m.

Course No.	SPEAKER	SUBJECT
408	Austin	.....SOLD OUT.....
410	Becker	Plastic Surgery of Protruding Ears
411	Beinfield	Surgical Management of Bony Choanal Atresia of Posterior Nares
413	Bellucci	Surgery of Stapes & Oval Window
419	Brown, H.	Otologic Evaluation of the Cerebellopontine Angle Tumors
429	Dickinson	Grafts & Implants in Repair of Facial Deformities
441	Glorig	The Otolaryngologist & Hearing Aid Selection
457	Jerger	Auditory Tests in Diagnosis
469	Lederer	Diagnostic & Therapeutic Pitfalls in ENT Practice
478	Myers	The Microsurgery of Otosclerosis
492	Ryan	Headache
493	Saunders	Oral Lesions
504	Skolnik	Velo-Pharyngeal Inadequacy
512	Van Alyea	Sinusitis

Key Th-3 — 11:30 a.m. to 12:30 p.m.

Course No.	SPEAKER	SUBJECT
412	Bell	Correction of Outstanding Ears
430	Erich	Fractures of the Facial Bones
434	Farrior, R.	Cervico-Facial Congenital Anomalies
435	Feldman	Practical Solutions of Bone Conduction Audiometry
439	Friedberg	Diseases of the Esophagus
449	Guilford & Wright	Stapes Mobilization Techniques
453	Hilger	.....SOLD OUT.....
456	House, H.	Stapes Mobilization Procedure
458	Johnson, F.	Tonsillectomy & Adenoidectomy Surgery
462	Kastein	Appraisal & Management of a Child with Audiological Problems
468	Lake	Secretory Otitis Media in Children
485	Rabbett	Submucous Resection of the Nasal Septum
497	Schuknecht	Removal & Preparation of the Human Temporal Bone
499	Sellers	Dizziness

SECTION ON INSTRUCTION

ADVANCE ORDER SHEET

All courses cost $2.00 for each period (one hour). Follow instructions explicitly and check for errors in listing before mailing.

Orders will not be accepted for presale after September 28. To ensure acceptance they should be mailed before September 26 to

WILLIAM L. BENEDICT, M.D., *Executive Secretary-Treasurer*
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(Over)

ADVANCE ORDER SHEET

ORDERS FILLED ONLY IF CURRENT DUES ARE PAID

NO REFUNDS WILL BE MADE AFTER OCTOBER 2

(Type or Print) Last Name First Name Middle Initial

Office Address

City Zone State

Days to be Present

- ☐ Monday
- ☐ Tuesday
- ☐ Wednesday
- ☐ Thursday

Total Amount Enclosed $_____

SELECTION OF COURSES ON REVERSE SIDE OF THIS BLANK

RECAPITULATION OF GENERAL INSTRUCTIONS

1. Monday, Tuesday, Wednesday, and Thursday are represented by the letters M, T, W, Th. The first period in the morning is represented by figure 1, second period by figure 2 and third period by figure 3. The first period in the afternoon is represented by figure 4, second period by figure 5, and third period by figure 6. All courses in otolaryngology and maxillofacial surgery are presented in the mornings. All courses in ophthalmology are presented in the afternoons.
2. Reservation of instruction tickets in advance of the meeting will be made ONLY for MEMBERS whose 1961 dues have been paid. ACADEMY CANDIDATES AND GUESTS MAY MAKE SELECTION OF COURSES *ONLY* AT THE GENERAL REGISTRATION DESK IN CHICAGO.
3. Make check payable to W. L. Benedict, M.D.
4. Mail order promptly to ensure reservation of first choices. If necessary, an attempt will be made to rearrange schedule to include "first choices."

(Over)

SELECTION OF COURSES

PERIOD		FIRST CHOICE		SECOND CHOICE		THIRD CHOICE	
		Course No.	Lecturer	Course No.	Lecturer	Course No.	Lecturer
MON.	4						
P.M.	5						
	6						
TUES.	1						
A.M.	2						
	3						
P.M.	4						
	5						
	6						
WED.	1						
A.M.	2						
	3						
P.M.	4						
	5						
	6						
THURS.	1						
A.M.	2						
	3						
P.M.	4						
	5						
	6						

BOOK REVIEWS

OPTICS, AN INTRODUCTION FOR OPHTHALMOLOGISTS. By Kenneth N. Ogle, Ph.D. Springfield, Ill., Charles C Thomas; 1961. Board; 257 pp.; 179 figures; index, and table of contents. $8.75.

The book is based upon a series of lectures and laboratory demonstrations prepared for Fellows of the Mayo Foundation in the Section of Ophthalmology of the Mayo Clinic. Fourteen chapters include principles of physical optics and applied ophthalmic optics, instrumentation and illumination. Diagrams, figures and formulas are freely used to supplement the text and to visualize the optical properties of light as they are regarded in the examination of the eye and in the manufacture and use of ophthalmic lenses. It is assumed that the reader is familiar with the eye, its optical properties and the sensory receptive organs and their characteristics. A previous study of the physics of optics, including its mathematical treatment, is necessary for an understanding of the aims of this book, for it is not elementary nor is it theoretically comprehensive.

The prescribing of ophthalmic lenses is greatly simplified by tables of available stock and charts to direct machining for a finished product. Trained opticians make the necessary transpositions of a doctor's prescription to produce the desired correction. This requires a knowledge of ophthalmic optics. The optician and the ophthalmologist should have a common knowledge of the optical processes involved. The author has provided a course of study whereby the two supplement each other. It is the ophthalmologist who is usually lacking this knowledge because his optician provides the technical know-how. It is important, however, for the ophthalmologist to be familiar with the field if he is to make the most of his obligation to provide his patient with the most effective benefits of optical wear.

While originally prepared for students of ophthalmology, this book is most useful for research scientists, physiologists, optometrists, physicists, opticians and general readers who are interested in optics as applied to the eye and vision. It is recommended as a classroom text and teachers' guide.

W. L. B.

SPACE AND SIGHT. By M. von Senden, Ph.D. Translated by Peter Heath (Copyright by M. von Senden, 1932). Glencoe, Ill., The Free Press; 1960. Board; 325 pp. with added list of cases, list of works cited, and select bibliography (by B. R. Singer). No il. $10.00.

The author, born in Hamburg, gained his Ph.D. degree at Kiel University. He spent some years as a psychologist with the German Army.

The theme of this book is the perception of space and shape in the congenitally blind before and after operation. Part I deals with analysis of preoperative spatial data, the significance of residual vision in cataract patients for their consciousness of space; Part II, the attainment of visual space after the operation; Part III, vision in depth, and Part IV, consequences for the theory of space perception.

Understanding the problems of the blind is the prime requisite for rehabilitation. There is, therefore, a reason for the psychologist to probe the processes

by which one who is deprived of the sense of sight must orient himself in a world in which his fellow man operates with precision of motion in areas forbidden to the blind. The perception of form and space must be gained by the blind from senses common to all but used in supplementing the chief sense—that of sight. To a psychologically trained observer, a congenitally blind person, once operated on, may on occasion be able to provide information, not otherwise obtainable, on a great variety of psychological and philosophical problems; and will do so the more, the better the operator and his patient are prepared in advance for the psychological task in hand.

The ophthalmologist will like reading this book, filled with details of personal experiences either with persons who have gained sight after years of none or those who have lost sight after having experienced space and form with sight. There is a philosophical attitude of observation of human behavior well documented by an interested and trained psychologist who understands the mental processes of handicapped individuals.

W. L. B.

GLAUCOMA: CHEMISTRY, MECHANISMS AND THERAPY. By Sidney Lerman, M.D., C.M. Springfield, Charles C Thomas; 111 pp. $6.00.

An excellent monograph on glaucoma is presented. It reviews concisely the basic knowledge of the chemistry, physiology and mechanisms of glaucoma. Friedenwald's theory of aqueous secretion is discussed, and a unified concept of aqueous formation is presented.

Tonography and mechanisms controlling intraocular pressure are discussed in a brief chapter on aqueous flow and drainage.

A practical classification of glaucoma according to present-day knowledge is reviewed.

Medical and surgical treatment is discussed briefly with each classification. Detail is spared, and properly so in a monograph. However the bibliography is extensive and up-to-date.

The book should be valuable to the graduate student and for study by the ophthalmologist.

T. J. K.

CANCER OF THE NASOPHARYNX: ITS NATURAL HISTORY AND TREATMENT. By M. Lederman, M.B., D.M.R., F.F.R. Springfield, Charles C Thomas, 1961; 117 pp. $6.75.

In this monograph, Dr. Lederman gives an extremely concise but complete review of the anatomy of the nasopharynx and its adnexa together with a discussion of the influence of anatomy on the spread of malignancy. Symptomatology, histology and treatment of cancer of the nasopharynx are similarly presented.

The book is well written. It should be read and considered by all who care for patients with cancer of the nasopharynx, even though it seems to express, to a small extent, the feeling that cancer of the nasopharynx is only properly treated in the radiotherapy department of Royal Marsden Hospital.

H. L. W.

NEWS AND ANNOUNCEMENTS

NASSAU ACADEMY

The Inaugural meeting of the Section on Ophthalmology of the Nassau Academy of Medicine was held on May 22, 1961. John H. Dunnington, M.D., the guest speaker, presented a paper on "Complications of Cataract Extraction." Several interesting case reports were presented by members of the Section.

The next meeting of the Section will be Monday, November 27, 1961.

MONTREAL OPHTHALMOLOGICAL SOCIETY

A special dinner meeting of the Montreal Ophthalmological Society was held at the Queen Elizabeth Hotel on May 31, 1961, to honor Dr. Alfred J. Elliot on the occasion of his completion of fifteen years as Professor of Ophthalmology and Head of the Department, University of Toronto. Doctor Elliot is leaving Eastern Canada to take a new appointment as Head of the Ophthalmology Department, University of British Columbia, Vancouver, B. C.

Doctor Elliot addressed the meeting on "Hypolacrimation."

MEETING OF STATE SUPERVISING OPHTHALMOLOGISTS

Bureau of Public Assistance invites all Supervising Ophthalmologists associated with State Public Assistance Aid to the Blind programs to a Dutch Treat breakfast at the Palmer House on Sunday morning, October 8, 1961. Individual notices of time and room location will be sent later.

The agenda will include discussion of the relationship between the recommended definition of blindness and the use of modern optical aids.

CALENDAR OF OVERSEAS MEDICAL CONGRESSES

The Scandinavian Airlines System is making available a comprehensive calendar of overseas medical congresses and allied events which are to be held during the period from October, 1961, to December, 1962. The calendar lists all known medical events in areas served by the airline. A brochure outlining the program offered by the American Medical Society of Vienna also may be obtained from the Scandinavian Airlines. Details may be obtained from SAS offices or by writing to A. John Harrison, secretary, Medical Travel Section, Scandinavian Airlines System, 138-02 Queens Boulevard, Jamaica 35, New York.

NOTICE

The Pan-American Association of Ophthalmology will present its annual Pan-American cocktail party in the Cotillion Room of the Morrison Hotel, 5:30 to 8:00 p.m., Sunday, October 8. All Academy members, guests and Latin American visitors are invited. Tickets are available at the Pan-American desk.

SOCIETY OF MILITARY OPHTHALMOLOGISTS SOCIETY OF MILITARY OTOLARYNGOLOGISTS

The Society of Military Ophthalmologists and the Society of Military Otolaryngologists will hold a combined dinner meeting on Tuesday evening, October 10, in the Palmer House. Details regarding time and place of meeting will be announced.

PAN AMERICAN ASSOCIATION OF OPHTHALMOLOGY INTERIM CONGRESS — LIMA, PERU, JANUARY 28 - FEBRUARY 3, 1962

The Pan American Association of Ophthalmology will hold an Interim Congress in Lima, Peru, January 28 through February 3, 1962. All ophthalmologists are invited to attend.

The three official subjects to be featured are diagnosis and nonsurgical therapy of glaucoma (round table), steroid therapy (symposium), and cornea (individual papers). Postgraduate courses will be given at this Congress in English, Spanish and Portuguese. Simultaneous translations will be available during the discussion of the official subjects. Outstanding authorities have indicated their plans to participate in the meeting.

Free papers will also be presented. Applicants for papers of any type from the United States and Canada should send titles and abstracts to John M. McLean, M.D., 525 East 68th Street, New York 21, by October 30, 1961.

Motion pictures should be submitted in advance to Dr. Benedict Rizzuti, Chairman of the Movies Program, 160 Henry Street, Brooklyn 1, New York, for approval and inclusion in the program.

Scientific exhibits are under the Chairmanship of A. D. Ruedemann, Jr., M.D., 1633 David Whitney Building, Detroit 26.

Official travel agent for the meeting is Mr. Edward R. Brown, Harvey Travel Bureau, 2005 West Gray, Houston 19, Texas. Planned tours before and after the meeting and charter flights are being arranged. Past experience has shown that a central travel agency such as this is in a better position to handle all travel expeditiously and more reasonably than individuals. Those who make arrangements early enough will receive the benefit of having the best accommodations in the hotel where the meeting will take place.

The tours to Machu Picchu will necessarily be limited in number, and arrangements must be made early.

Outstanding social events are being planned.

POSTGRADUATE COURSES

The Mount Sinai Hospital

An intensive Postgraduate Course in Rhinoplasty, Reconstructive Surgery of the Nasal Septum and Otoplasty will be given January 13 to 26, 1962, by Dr. Irving B. Goldman and staff at the Mount Sinai Hospital, New York, in affiliation with Columbia University.

Candidates for the course should apply to Registrar for Postgraduate Medical Instruction, the Mount Sinai Hospital, Fifth Avenue and 100th Street, New York 29, N. Y.

AMERICAN LARYNGOLOGICAL ASSOCIATION

The Eighty-Second Annual Meeting of the American Laryngological Association was held at Lake Placid, New York, on May 21 and 22, 1961, under the presidency of Dr. Edwin N. Broyles. A scientific program was presented.

The DeRoaldes Award was presented to Dr. Frederick T. Hill of Waterville, Maine, in recognition of his many contributions to the specialty of Otolaryngology and his services to the medical profession.

The Newcomb Award was presented posthumously to Dr. Chevalier Lawrence Jackson in recognition of his outstanding work in the field of Bronchoesophagology and for his untiring devotion to the furtherance of cordial relations with the medical fraternity of South America.

REVERE AWARD

The Revere Publishing Company has announced a $1,000 annual Revere Award to encourage and promote excellency in medical reporting of clinical studies.

This award is made to the senior author of the paper published in **The Journal of New Drugs** for the ensuing year, judged to be the best on the basis of originality and interest, design of study, conduct of trials, validity of conclusions, clarity of

presentation, and general importance to the medical profession. The **Journal** invites manuscripts for publication in the following categories:

Clinical reports—Papers of an original and scientific nature which deal with the clinical effects of the newer drugs and pharmaceutical preparations.

Symposia—Symposia on the laboratory and clinical effects of a new compound or on a particular aspect of new drug investigation.

Preliminary reports — Original papers dealing with preliminary findings of the clinical effects of new drugs.

Negative reports—Negative data relating to lack of therapeutic effects, toxicity, side effects and contraindications.

Research reports—Papers of an original nature describing investigations (in vitro or in vivo) or developments relating to the pharmacological actions or new compounds.

Special articles — Papers relating to methods of drug evaluation, including the design, conduct and reporting of clinical studies.

Professional standards — articles dealing with ethics, obligations, and responsibilities of clinical investigators that aid in establishing uniform practices.

Papers submitted should not include data published previously and are accepted for publication on condition that they are contributed solely to the **Journal**. They should be sent to Editor, The Journal of New Drugs, 660 Madison Avenue, New York 21, N. Y. A sample copy of the **Journal** is available on request.

AMERICAN BOARD OF OPHTHALMOLOGY—1962 DIRECTORY

The American Board of Ophthalmology is now compiling the new 1962 directory, the names to be listed alphabetically and geographically. Cards were mailed to all diplomates who are urged to return them at once if they wish their names and addresses to be correctly listed.

There is no charge for the listing. The purchase price of the directory is $5.00 postpaid with gratis annual supplements. Checks must accompany order; no C. O. D.'s. Delivery about March 1, 1962.

POSITIONS AVAILABLE

OPHTHALMOLOGIST wanted. Board-certified or Board-eligible. Fully equipped office and active practice of recently deceased ophthalmologist for sale. Records are intact. Terms can be arranged. For further information, please write Mrs. Henry H. Black, 4062 Jenkins Arcade Building, Pittsburgh.

EXCELLENT OPPORTUNITY for E.N.T. specialist. Fully equipped office and established practice of recently deceased otolaryngologist for sale. Town of 92,000. Very busy industrial center. Office centrally located with no problem in parking. For further information, please write Mrs. Frank C. Furlong, 713 Union Street, Schenectady 5, New York.

OTOLARYNGOLOGIST wanted. Fully equipped office in northern suburb of Chicago on Lake Michigan. University town. Practice of deceased (July 1961) associate professor (Northwestern University Medical School) and chairman of division at Evanston Hospital for sale. Potential unlimited. Contact: L. J. Lawson, Jr., M.D., 636 Church Street, Evanston, Ill.

OTOLARYNGOLOGIST — Board certified or qualified for Southern California Permanente Medical Group. Salary open with progressive increases, retirement plan, work towards partnership and other benefits. Opportunity to do all types of head and neck surgery. Dr. L. S. Buck, Chief of the Department of Otolaryngology, will be registered at Academy Meeting in Chicago for interviews.

Listings of positions available should be sent to W. L. Benedict, M.D., 15 Second Street S. W., Rochester, Minn., by the fifth of the month preceding publication. They should include (1) type of physician wanted (ophthalmologist or otolaryngologist: diplomate, resident, etc.) (2) type of position to be filled; and (3) to whom to write for further information. Unless otherwise requested, listings will be published only once.

The Academy will handle no further correspondence beyond the listing and assume no responsibility. Neither does it endorse nor guarantee any of the published listings.

LISTING OF AUDIOMETERS

The following audiometers are recommended for listing by a subcommittee of the Committee on Conservation of Hearing, American Academy of Ophthalmology and Otolaryngology:

PURE TONE AUDIOMETERS

Beltone Model 10-C Model 15-C	Beltone Hearing Aid Company Audiometer Division 2900 West 36th Street Chicago 32, Illinois
Maico Model MA-5 Model H1-B for pure tones only	Maico Electronics Inc. Maico Building 21 North Third Street Minneapolis 1, Minnesota
Sonotone Model 91	Sonotone Corporation Elmsford, New York
Zenith ZA 200	Zenith Radio Corporation 6501 West Grand Avenue Chicago 35, Illinois

SPEECH AUDIOMETERS

Grayson-Stadler Model 162	Grayson-Stadler Co. West Concord, Massachusetts

SCREENING AUDIOMETERS

Ambco Otometer 600	Ambco Inc. 1222 W. Washington Blvd. Los Angeles 7, California

Each model number in the list as a rule indicates the most advanced model of that series. If less advanced instruments are for sale under similar model numbers, it is assumed that they will function as well or better than the more complicated model in a series.

Acceptance for listing means that the audiometer manufacturer has demonstrated the ability to produce one instrument that performs according to A.S.A. specification. It does not imply that any individual instrument will perform within the tolerances. It is obviously beyond the scope of the Listing Committee or the Referee Laboratories to provide production control for audiometer manufacturers and their customers; however, listing does indicate that the product of the manufacturer can come up to 1951 A.S.A. specifications, and it is up to the customer to carry on negotiation with the manufacturer if a particular instrument which he receives is faulty.

Abatron D-100 and Ambco Oto-chek 800 were removed from the above list at the request of the respective manufacturers.

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American Academy of Ophthalmology and Otolaryngology
15 Second St. S.W., Rochester, Minnesota

Name.....

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For countries outside the United States:

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Prednefrin Forte®

OPHTHALMIC SUSPENSION

When severe ocular inflammation threatens vision, Prednefrin Forte provides the therapeutic potency needed for effective control . . . in cases where other topical preparations have failed.

What makes Prednefrin Forte so effective?

Prednefrin Forte is the most potent topical preparation you can use—it contains prednisolone acetate in a concentration of 1.0%. Furthermore, the prednisolone is presented in an extremely fine, aqueous suspension (the particles are approximately half the size of a red blood cell). Because the special suspension remains in the eye for a prolonged period after instillation, a repository-type dosage is obtained. Anti-inflammatory action is continuous and uniform—patient response, even in the most severe anterior segment inflammatory condition, is often seen within hours.

FORMULA: *Prednefrin Forte Contains . . .*

Prednisolone acetate	*1.0%*
Phenylephrine HCl	*0.12%*
Methylcellulose	*0.12%*

DOSAGE: *1-2 drops in the conjunctival sac two to four times daily. During the initial 24-48 hours the dosage may be safely increased to 2 drops every hour.*

SUPPLY: *In 5 cc. plastic dropper bottles — on prescription only.*

UNSURPASSED POTENCY FOR OCULAR INFLAMMATIONS BEYOND THE CONTROL OF ORDINARY STEROID STRENGTHS

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